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Problems Involved in Lighting of Signs and Billboards

Size and Shape of Letters and Spacing and Characteristics of Lamps Determines Appearance—Different Treatment for Large and Small Displays—Many Types of Equipment Now Standard

By J. M. SHUTE

Edison Lamp Works, Harrison, N. J.

Illuminated signs are almost as old as history itself, but until the development of the incandescent lamp lighted signs were crude and rare because of the impossibility of effectively applying such light sources as were available. The first electric sign of which we have record was used shortly after the commercial use of the incandescent lamp had been demonstrated. This sign, made by Major Hammer in 1882, very appropriately spelled the word "EDISON" and was used at the International Exposition at the Crystal Palace in London. It was of what is now called the flasher type and was operated by hand switches.

Recently, with the advent of peace, and the development of new types of lamps, interest in sign lighting has been revived to such an extent that the business in this field has grown by leaps

"Sonora" Sign, 50 Ft. High by 110 Ft. Long, Lighted With 2835 Sign Lamps of 10-Watt Size, 273 Type C, 75-Watt Lamps, and 478 Daylight 75-Watt Lamps.

Billboard of Good Design and Construction Illuminated in Substantial and Satisfactory Manner.

and bounds, making the subject one of importance to the engineer, central station, and the various branches of the electrical industry.

Illuminated signs are valuable in attracting the eye as a result of their contrast against some background (a building or the sky). This contrast is produced in three manners: (1) Visible brilliant lamps used to spell the message, or as a part of the decorative scheme. (2) Transmitted light or silhouette effects with concealed lamps, as in transparencies. (3) Reflected light as in illuminated painted signs and billboards. Frequently all these methods are combined on one sign.

Signs with visible lamps are the most universally used of any type. They vary in size from huge roof signs which send their glittering messages to the inhabitants of our great metropolitan cities to the small signs over the doorway of the village store. Signs of this type interest the designer chiefly on account of their wide usage, and because they present such a multiplicity of design problems. The readability of a sign letter is influenced by a number of elements. Aside from the occular peculiarities of individuals and the atmospheric conditions, such factors as the spacing and size of letters and the size, finish, spacing and color of lamps determine the size of the sign necessary for a given service.

Design of letters—Spacing.—It is known that the human eye can distinguish as separate objects things so spaced that the angle subtended by them and the eye exceeds 1 min. Therefore, in constructing signs if the various letters are spaced so that the distance between any two subtends an angle of at least 1 min. at the distance which has been determined the maximum at which the sign is to be read, each letter can be seen as a separate letter. However, in common practice it has been found that spacing distances varying from 40% to 60% of the letter height give the best results for roof signs, though in special cases spacing distances of over 75% of the letter height have been used.

Size.—The size of the letter is another factor governing the readability of the sign. Proportions of each letter must be such that the letter appears clear to the observer. It has been found in common practice that letters having a length equal to two-thirds or three-quarters of the height are the best, not only from a standpoint of appearance but also because of readability.

The height of a letter also has a great effect on its readability. This is true not only because the increased height makes it visible at a greater distance, but due also to the fact that in a letter of large dimensions the integral parts of the letter are farther apart and therefore the distance from the letter to the point at which the eye subtends an angle of 1 min. with any two integral parts of the letter is greater. The effect on

TABLE SHOWING THE BASIC PROPORTIONS OF STOCK LETTERS AS GENERALLY USED.

Height, ins.	Length, ins.	Width, ins.	Space, ins.	Voltage.	Watts.
24	18.0	4.0	5.5	10- 12-55-65-110	5-10- 25
30	22.5	5.0	7.0	10- 12-55-65-110	5-10- 25
36	27.0	5.5	9.0	10- 12-55-65-110	5-10- 25
42	31.5	6.0	11.0	110-125	10-25
48	36.0	8.0	12.0	110-125	10-25
60	45.0	10.0	15.0	110-125	10-25- 50
72	54.0	11.0	18.0	110-125	25-40
84	63.0	13.0	20.0	110-125	25-50- 75-100
96	72.0	15.0	21.0	110-125	50-75-100
108	81.0	18.0	24.0	110-125	50-75-100
120	90.0	20.0	27.0	110-125	50-75-100
144	108.0	24.0	30.0	110-125	50-75-100

readability due to the stroke width of letters is seemingly contradictory, since in daylight the wider it is the greater the distance of readability, while at night the readability of any given letter increases as the stroke width decreases. From these facts it is seen that this dimension will depend to a great extent on whether the sign is to be used primarily for night or day use. Service conditions for a given sign must be balanced before deciding, and then the width which gives the best service under all conditions should be chosen.

In practice it has been found that stroke widths of from 20% to 25% of the letter height are generally used. For some signs which are used extensively for both day and night service the letters have been made fairly wide to give readability during the day. On the face of the letter and perpendicular to it have been fastened metal strips or troughs in such a position as to divide the letter face into thirds. The strips are painted the same color as the letters and thus do not interfere in any way with the appearance of the sign during the day. The lamps are placed between the two metal channels; that is, in the center section of the letter, and thus at night the light from the lamps is confined by the channels and the letter appears only one-third the width seen in daytime and is evenly and brilliantly illuminated. Such letters have been tried on some of the

large roof signs and have given very good results.

While from tests it has been found that certain dimensions for sign letters are best theoretically for the highest readability, yet when it comes to the actual design of signs for commercial use these dimensions often must be changed very decidedly to give the sign its proper appearance. Often, a sign which is far from being theoretically perfect will under the conditions for which it is intended give the best service. The sign engineer must consider all conditions under which a given sign is to be used, and the results desired, and then from his experience decide upon the dimensions best suited to the particular case at hand. The design of signs like that of so many articles which are put upon the market in large quantities is too likely to degenerate into a practice of following a path of least resistance, and utilizing something which has been used elsewhere, and is perhaps most particularly suited to some other purpose.

Type.—Whether it is necessary to use a channel or flush construction of letter depends upon the size and the service for which it is designed. For large letters such as are used on the huge roof signs the trough may be neglected. Here the sign is so large that it is readable at the maximum distance at which it will be visible, and a trough on letters of such size would have little effect. However, signs with the same kind of letters used by merchants or by theaters, and displayed over the sidewalk at a comparatively low hanging height, are improved by the use of troughs. The letters of such signs are seldom over 5 ft. in height, and a trough adds to their attractive appearance as well as confining the light in useful areas. The chief advantage of such a trough is increased readability when the sign is viewed at an angle, and it is also found that as the depth of the trough is increased up to a certain limit the readability increases.

General Considerations Involved in Selection of Proper Lamps.

Not only is it necessary to design a sign which is suitable for the purpose for which it is intended, but it is highly necessary that it should be properly maintained if a good impression is to be continuously created. For instance, renewals of burnt-out lamps should be carefully attended to as the appearance of a sign with broken letters or similar defects is usually an advertisement of carelessness or incompetency of the owner and does not attract business.

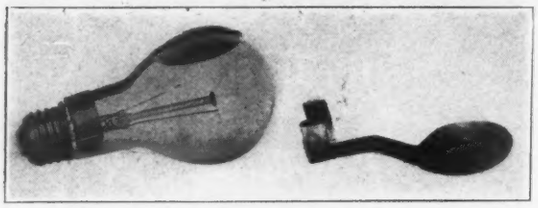
Sign 40 Ft. Wide and Containing 1320 Low-Voltage 5-Watt Sign Lamps.

Theater Sign of a Type Bound to Attract Attention.

In the matter of selecting lamps for signs, as in the design of letters, a number of variable factors must be considered. A roof sign high up on a skyscraper must have such brilliance that the sign stands out in contrast to the background. The advertiser desires to bring to the attention of the passerby a certain article with such brilliance that the idea is impressed on his mind. Such a sign must have no subdued light as is obtained by lamps equipped with some form of diffusing medium, like frosting or enameling. but, rather, should have a glittering brilliancy—almost a glare—as obtained from a clear lamp.

While within working limits the readability of a sign decreases as the brilliancy of the lamps increases it should be remembered that signs attract by their brilliancy, and the advertising value in many cases should not be lessened to improve readability. For roof signs this factor may be neglected, as at all times the distance between the sign and the observer is such that the brilliancy is not objectionable. In present practice the signs in large cities are of such a high brilliancy that additional ones, unless they are at least of equal brilliancy with the surrounding signs, will not attract attention and their value as an advertising medium is lost. However, the smaller signs on the fronts of buildings, and hanging close to the street, must necessarily be of a much lower order of brilliancy; otherwise the observer will be blinded by the flood of light and the sign will be illegible, thus defeating its purpose. If because of high general illumination it is necessary to have the small, low-hanging sign illuminated to

a high intensity some form of diffusing medium must be employed on the lamps in order to prevent the blinding of the observer by the high intrinsic brilliancy of the lamp filament. By



Protection Cap for Use With 75 and 100-Watt Type C or Daylight Lamps.

using frosted lamps the appearance of the signs hanging close to the street is greatly improved, especially, to observers at a short distance from them, although the readability at a distance is not greatly changed.

Atmospheric conditions sometimes affect the readability of a sign to a great extent. A slightly foggy or smoky atmosphere has a tendency to cause an absorptive effect blanketing the high intrinsic brilliancy to such an extent that it more than offsets the dispersive effect, tending to blur the letters and cause the sign to be readable at a greater distance than in a clear atmosphere. Although at times atmospheric conditions affect the readability of a sign, in general, the readability is independent of such conditions.

The position of a sign often determines the lamp to be used. In metropolitan districts where signs are numerous, a sign must have a sparkle and brilliance which will make it stand out among others to such an extent that it will attract attention. In the case of a factory located near a railroad in a district where there are few electric signs a large roof sign illuminated by lamps in diffusing bulbs will be very attractive. Here the sign will be not only conspicuous, but illuminated to a high intensity with an even whiteness, giving no glare from individual lamps. Thus, it is seen that in the matter of choice of lamps for a sign it is often the conditions under which the sign is to be used that will govern the choice of lamps.

For the small signs with which a trough letter would be used we have a different problem. A more diffused or softened light is desirable, and low-wattage lamps which either have been enameled or dipped in various colors improve the appearance of the sign and attract the eye of the observer because of the color combination of light.

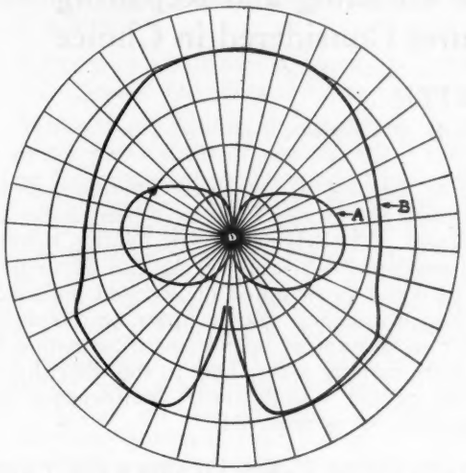
Size and Type of Lamps for Large Metropolitan Roof Signs.

For large signs mazda daylight lamps give a white brilliance, causing the sign to show up in direct contrast with the background. For some of the larger roof signs the 75- and 100-watt lamps of this type are used, and they stand out in marked contrast to their surroundings. In using such lamps it should be borne in mind that unless the sign is high above the observer the glare will be so intense that the sign becomes illegible and its whole purpose is defeated. Sign engineers should also bear in mind that lamps of high wattage in gas-filled bulbs are not designed to be burned under adverse weather conditions, nor in a horizontal position. When burned in this position the heat from the filament causes a hot spot on the upper side of the bulb which, if struck by rain, will cause the bulb to crack and the lamp to burn out. Breakage of these higher-wattage lamps can be greatly lessened if some means of protection is furnished to the lamp. If the hot spot at the top of the bulb is covered by a cap in

The "Fisk Tires" Sign on Broadway Contains 3000 Daylight 75-Watt Lamps, and is 129 Ft. in Length.

such a way that rain or snow is prevented from striking it the chance of breakage is much less.

The simplest and most easily applied protector available is the sheet-metal protector cap. The protection caps will greatly lessen the injurious effect of a storm, but cannot totally prevent broken lamps. In other examples 75- or 100-watt clear bulb type C lamps are used. They also present a brilliant appearance and make an effective sign.



Distribution Curves of 10-Watt Sign Lamp and 25-Watt Blue Sign Lamp.

Methods of protection similar to those recommended for daylight lamps must be used, and their use cannot be indiscriminately recommended because of the probability of excessive breakage. For this reason there are many cases where the 50-watt blue type B sign lamp can be used with less chance of breakage, as the bulb does not become so hot. By spacing these lamps closer an almost equal brilliance can be obtained at less cost than by using the larger gas-filled lamps.

Size and Type of Lamps for Small and Low-Hung Signs.

Lately it has been found that 5- and 10-watt type B lamps for sign lighting, now in general use, do not give the desired light intensity. With the present standards of illumination higher than those of the past signs equipped with such lamps sometimes do not even attract the eye when competing with the brighter store windows and general street lighting now common to our large cities. There are available lamps of higher wattage that meet the needs of these new signs. The new blue sign lamp made in 25- and 50-watt sizes will increase the brilliancy of signs to such an extent that these signs will have a pleasing appearance and attract attention even in brightly lighted areas of our large cities. These lamps are recommended for such use because of the added brilliancy and whiteness they give to a sign, and also of their ruggedness and better mechanical characteristics for such service. Since the lamps are short they may be used effectively with trough letters as designed for 10-watt lamps, thus making replacement easy and new construction standard and inexpensive. Because of the coiled filament the light source is concentrated and symmetrical and the blue glass bulb gives them the appearance, when viewed horizontally, of brilliant white spots of light. Since these lamps are of the vacuum type there is no chance of excessive storm breakage as there is no concentration of heat to any particular part of the bulb.

Size and Type of Lamps Employed in "Talking" Signs.

All signs of the "talking" type, though different in appearance, are essentially the same in principle. Such signs have the advantage of not advertising a single product, but several successively, each of which is flashed on for a short interval of time to be followed by an entirely different advertisement at the next flash. With each sign of this type some special method of flashing is used to obtain the effects produced.

Since each letter space becomes virtually a mass or solid bank of lamps it is necessary to inclose each lamp in a short cylindrical metal tube. This prevents light being thrown on the face of the sign, which would cause a blurring effect due to cross reflection through adjacent bulbs. These tubes have the same general effect as a trough on the regular type of sign letter. In the past these signs have ordinarily used the 5-watt low-voltage sign lamps, but now that blue lamps for sign use are available manufacturers of this type of sign should quickly recognize the advantage of the coiled filament construction with its high end-on candlepower. The use of such lamps would greatly increase the brilliancy and illumination of the letters, thus bringing the advertised product more forcibly to the eyes of the public and "make" the sign as an advertising medium.

DATA ON USE OF PUBLIC UTILITY SERVICE IN OHIO.

Figures compiled recently from reports on file with the Ohio Public Utilities Commission show that there are in Ohio 933,011 customers of natural gas companies; 785,755 telephone subscribers; 602,618 customers of electric light and power companies, and 9250 users of artificial gas. In addition, the reports show more than 1,000,000,000 passengers were carried by the city and interurban electric railway companies of the state during 1920.

The figures indicate the widespread use of public utility service throughout the state and tell the story why Ohio ranks so high among the states in industrial and civic progress. In the production and distribution of electrical energy, Ohio ranks fifth in the United States, distributing 2,785,000 kw-hrs. during 1920, or 7.16% of the total amount distributed in the country. In the number of farms that have gas or electric light service, Ohio leads all other states with a total of 452,809 farms, or 7% of all farms in the United States.

The Department of Commerce has issued circular No. 112 of the Bureau of Standards dealing with the telephone service. It exhaustively describes the development of the telephone art, equipment of the telephone plant, principal elements of telephone service, and public relations, and concludes with a summary of the development of the telephone industry. Many interesting photographs are used for illustrations.

Ornamental Boulevard Lighting in Cleveland Parks

Size and Type of Lamps Selected After Study of General and Special Requirements — Provision for Cleaning and Repairing Lantern—Safety and Ornamental Features Considered in Choice

By C. G. BECKWITH
Superintendent of Light and Heat, City of Cleveland.

Due to the more general use of city parks as community pleasure centers and to the increasing motor vehicle traffic, park and boulevard lighting is assuming a new status. The modern system recently installed in Edgewater Park, Cleveland, was insofar as possible designed to embody the following boulevard lighting requirements: (1) The standard should be of pleasing appearance both by day and by night. (2) The equipment employed should distribute the light efficiently and without undue brightness in the direction of the eye. (3) The system should be safe, simple, reliable and easily maintained at its original effectiveness. (4) There should be adequate illumination on the boulevards to facilitate the heavy traffic and to reduce the likelihood of traffic accidents and crime. (5) The system should be of such a design that it will satisfy and at the same time advance civic pride.

Edgewater Park Lantern Having Lines Similar to Those of "White Way" Unit.

During the past 10 yrs. three different systems for lighting Edgewater Park have been discarded as deficient. The original electric lighting system, which employed overhead wiring and 6.6-ampere open carbon arcs mounted on wooden poles and spaced approximately 400 ft. apart, was replaced in 1912 on account of insufficient illumination by 10-ampere flaming arcs. Due to the difficulty of securing proper candlepower maintenance the flaming arcs were removed.

Development of Large Incandescent Lamps Changes Street Lighting Situation.

It was at this time that the type C or gas-filled tungsten lamp came into prominence, and its easy adaptation to ornamental lighting was at once recognized. An ornamental system consisting of 250-candlepower type C lamps spaced about 250 ft. apart was then installed. However, the type of standard used was a converted gas post only 9 ft. in height, and the extremely low mounting of the light source resulted in a poor distribution of light on the drives and undue brightness in the line of vision. Since the lighting effect was not highly satisfactory, and since in addition some operating difficulties due chiefly to faults in the underground wiring had arisen, plans were made some 2 yrs. ago to replace the old equipment with a complete modern installation. The very satisfactory appearance and illumination effectiveness, and the low maintenance cost of the lanterns developed for the Cleveland "White Way" installation, led to the development of a unit adapting the salient features of this lantern for the Edgewater Park system.

Accompanying illustrations show the similarity between the two units—the top glass section and center portions of the lanterns as well as the steel column and certain castings of the standards are interchangeable, thus reducing the number of stock parts necessary. Both the park and the "White Way" lanterns are glazed with a slightly opalescent rippled crystal glass. This glass was chosen after experiments with several score of different samples had been conducted with the view of obtaining a glass which, without destroying the very efficient distribution of light from the refractor, would break up the light rays sufficiently to avoid glare, and give the impression of a lively sparkle. The glass is placed with the smooth face outward, and the lantern is constructed as nearly air tight as is possible without excessive expenditure in order that dust collection will be retarded.

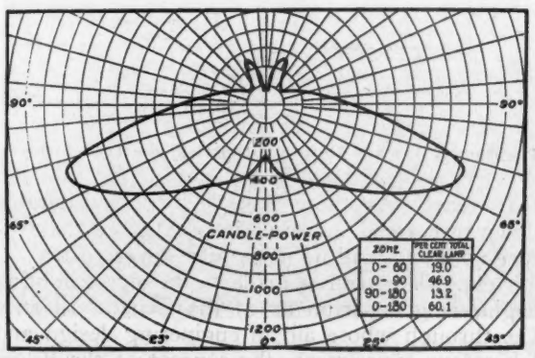
Experience has indicated an incidental but practical advantage of the lantern structure in that the replacement cost of broken panels is low. This results not only from the low cost of an individual panel, but also from the circumstance that since the glass is divided into comparatively small sections the chief stresses are carried by the lantern structure, and there is therefore much less tendency for the glass to become broken than in the case of a single globe of comparable size held only by a fitter.

Park Lanterns Designed to Diirect Liight Below the Horizontal.

In "White Way" lighting it is desirable to employ some type of globe or lantern which allows sufficient light upward to illuminate the facades of the buildings and relieve the tunnel-like appearance of the street which would otherwise prevail. This desideratum does not obtain in park or boulevard lighting and therefore the park lantern was designed to have but a small proportion of upward light. Thus, while the "White Way" lantern is equipped with a band refractor and a flat reflector with a comparatively large opening in the reflector for the upward component of light, the park lantern is equipped with a dome refractor and a curved reflector which allows very little light to be transmitted upward.

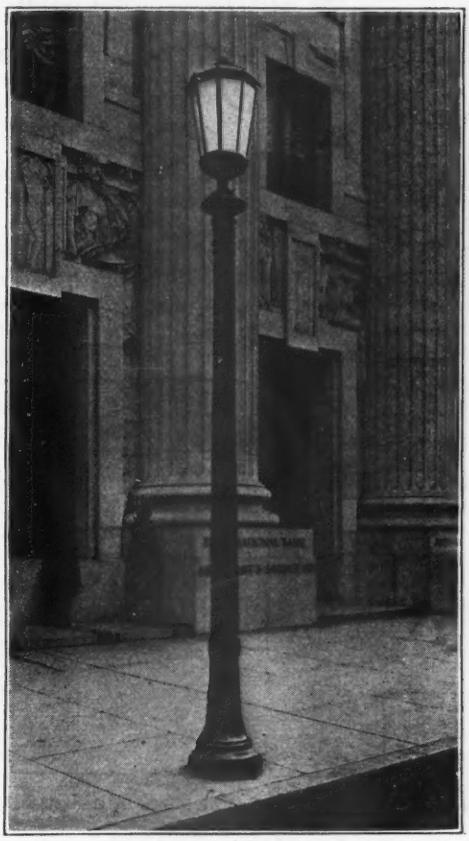
Except with levels of illumination of the order of that provided in the principal business district of Cleveland, where 1500-cp. lamps are spaced approximately 85 ft. apart and located opposite each other on both sides of the street, it is necessary to depend to a considerable extent for the discernment of objects on silhouette and shadow effects. The silhouette may be either against the spot of light beneath a lamp, or, particularly in the case of boulevards which have acquired a black polish from heavy continuous traffic, against the mirror-like streaks of light reflected by the gloss of the pavement surface. In order to obtain the maximum benefit from this so-called glint effect, and also to obtain a better distribution of light on the street with the minimum of light interference from tree foliage, the park standard was designed to have the lantern suspended from a bracket arm extending over the street. An increased downward candlepower is secured by placing glass panels in the bottom of the lantern. The candlepower distribution curve of the lantern is shown in an accompanying diagram.

The standards employed are of corrugated rolled steel with cast iron arm, capital and base, the whole being held together with three tie rods



Candlepower Distribution Curve for Park Lighting Unit.

running up through the columns. This construction of standards was adhered to following the very satisfactory results obtained with the rolled steel columns in the "White Way" installation. There it was found that damaged standards could be repaired in almost every instance at a comparatively low cost, and that, due to the rigidity of the lantern, the glass panels were seldom broken



Lantern Employed in Construction of "White Way" System in Cleveland.

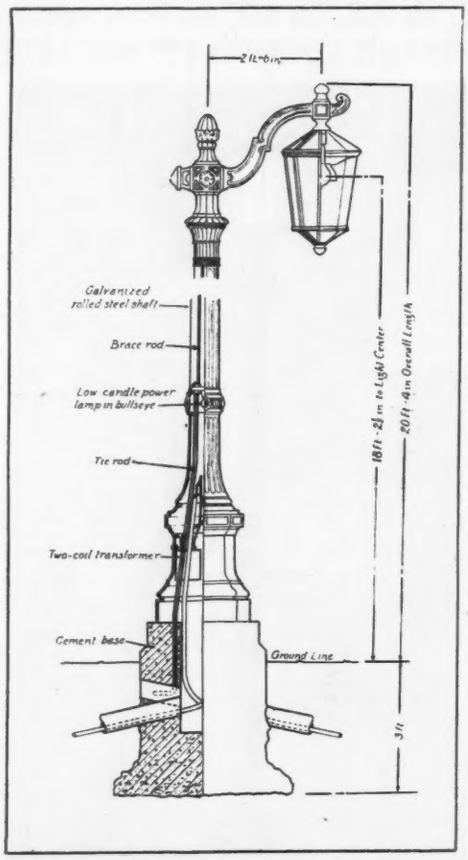
even though the standards were in some accidents bent at right angles.

The park installation to date has some 200 type C 600-cp. series lamps which are divided into four circuits. The lantern suspension arms are located about 20 ft. above the ground, and the standards are spaced approximately 200 ft. apart. In the base of each there is placed an individual 2-coil transformer, which eliminates the necessity of film cutouts and the danger from high voltage wires and also allows the use of the more efficient high-amperage lamps. The 2-conductor underground cable employed is made up of No. 8 B. & S. gage wire with 6/32 in. by 2/32 in. paper insulation. It is jute filling, has a 5/64-in. lead sheath, and is placed in 3.5-in. fibre duct 24 ins. underground. The cascade method of control with pole-type transformer is used. An accompanying diagram shows in detail how the method was worked out for this specific installation.

Novel Features Incorporated in Construction of System.

There are several novel features introduced in the system with the purpose of insuring safety to vehicle drivers and facilitating maintenance of

the equipment. Due to the physical characteristics of the grounds it was desirable in several places to change the line of units from one side of the boulevard to the other. Where this arrangement is resorted to the cross-over is made



Sketch Showing Arrangement of Parts in Complete Unit.

obvious by placing the first unit of one line exactly opposite the last unit of the other line on the other side of the drive. A difficulty in the case of some underground installations is the inconvenience experienced when repair or replacement of a section becomes necessary. In this installation the fiber duct is curved up through the base of each standard. This arrangement provides easy access to the cable and an outlet from which sections of cable may be drawn from one standard to another.

TABLE SHOWING INSTALLATION COSTS PER LAMP OF PARK LIGHTING SYSTEM.

Item.	Cost per Lamp.
Fibre duct, 3.5 in	$ 15.80
Laying duct and pulling in cable	25.00
Cable	50.00
Cement base installed	22.00
Standard, lantern, glassware and signal lamp	187.23
Erection of standard and lantern	8.58
Lamp	3.20
Individual 2-coil transformer	13.54
Pole-type constant-current regulator ($393.75)	7.88
Relay ($40.00)	0.80
Electrically operated oil switch ($110.00)	2.20
Incidentals	1.79
Total	$338.02

From previous experience a cleaning schedule was planned for this system whereby at intervals of a month the accumulation of dust and dirt is removed from the glassware by brushing and washing with hot water. In addition to this monthly cleaning the complete lanterns will be taken to the substation at least once each year for an exceedingly thorough scrubbing with a brush and cleaning compound in boiling water, followed by an inspection and overhaul to renew any cracked glass panels or other defective parts. In order to facilitate the removal of the lantern from the bracket a somewhat novel construction was developed in which the wiring and socket are not connected to the lantern, but remain a permanent part of the bracket arm. The lantern itself is carried by a bayonet holder. Hence, when the lantern is to be removed, it is only necessary to take the lamp out through the hinged side door panel, lift the lantern slightly and turn it, which frees it completely. Even though the lantern can thus be very easily and quickly removed or replaced, the construction of the holder is such that there is practically no likelihood of a lantern becoming detached by accident or by vibration in the wind.

Provision Made to Prevent Accidents Resulting From Lamp Outages.

With a lamp outage there is, of course, an area left in comparative darkness, and in the past it has been a rather common occurrence for the driver of a fast moving vehicle to collide with a standard which, located on a curved drive and in darkness, could not readily be seen. In order to eliminate the likelihood of these accidents there is placed in each standard, about 6 ft. above the ground, a bullseye with colored glass in which is installed a low-wattage lamp connected in multiple with the 600-cp. lamp off the individual 2-coil transformer. When the large lamp is in operation the signal lamp behind the bullseye is burning at such a low voltage as to emit only a very faint glow. However, immediately upon the failure of the main lamp the signal lamp, due to the open-circuit rise in voltage on the secondary of the 2-coil transformer, is subjected to its normal voltage and the bullseye signal shines out brightly.

An accompanying table, based on 50 lamps per circuit spaced 200 ft. apart, gives installation cost data per lamp on the park installation excluding station equipment and high-tension distribution. The material was purchased during the first 3 mo. of 1920 and installed during the summer of

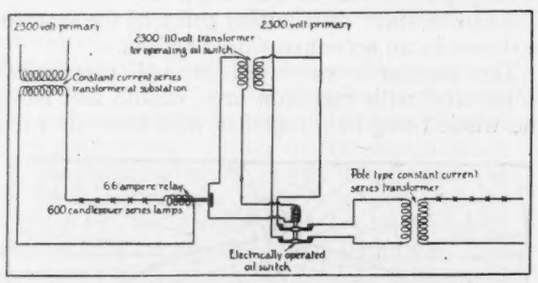

2300 volt primary
2300 volt primary
2300-110 volt transformer for operating oil switch
Constant current series transformer at substation
6.6 ampere relay
600 candlepower series lamps
Pole type constant current series transformer
Electrically operated oil switch

Diagram of Cascade Control with Pole-Type Transformers.

that year. As there has been a considerable downward trend in prices it is expected that future additions will be made at a lower cost.

Acknowledgment is made to the street lighting engineering departments of the General Electric Co. through whose aid in enginering design and laboratory experiments the concept of the Edgewater Park system was made practical.

Lighting for Art Galleries and Public Buildings—Part II.

Color Quality of Light Plays Important Part in Illumination of Paintings, While Direction Is a Most Vital Factor With Statuary — Architectural Effects Are Enhanced or Lost by Illumination

By E. H. PARKER

Another factor which requires attention when skylight lighting is employed is the continually changing quality of daylight. Some method of regulating the intensity when it becomes too strong, and of cutting out the direct rays of the sun, must be provided for. One way of accomplishing this result is to install a system of adjustable louvres between the skylight and the subskylight which may be operated from the room below either pneumatically or electrically. The louvres may be metal panels, similar to those in the Chicago Art Museum, or they may be wooden frames covered with a suitable cloth. They should be arranged so that by opening the space between adjacent sections more light is admitted and thus a flexible control of the intensity in the gallery may be had. The control of the light in the Metropolitan Art Museum is accomplished by means of draw curtains which can be drawn between the two skylights to reduce the intensity or cut out the rays of the sun.

Selection of the glass employed in the skylight is also an important feature in an installation of this kind. The glass should, of course, be of sufficient density to obscure the overhead construction from the room below. In some instances the glass may already be in place before the lighting equipment is considered, and when this is the case the lighting equipment must be selected which gives the highest possible efficiency with the proper illumination of the room below in order to secure satisfactory results.

An Intensity of 6 Foot-Candles Obtained in This Display With 40-Watt Lamps Spaced 12 Ins. Apart in Trough Reflector, Producing Good Effects.

Glass suitable for this work is of two types, the so called refracting glass, which bends the light rays, and the diffusing glass which serves more or less as a secondary source in the illumination of the gallery. In the former class are such glasses as pebble, ripple, and stipple, while in the latter class there are such types as opal, frosted, etched and sand blasted glass. The refracting glass is of a higher efficiency than the other, due to the small amount of light which it absorbs, but, on the other hand, the diffusing glass will present a more uniform appearance from the room below.

To generalize, the less diffusing a glass is the closer together the units must be placed to obtain satisfactory illumination in the room below, and if the space above the skylight is limited a good spread of light will be obtained if a diffusing glass is used. Installations of this nature consume from 2 watts to as high as 6 watts per sq.

Gallery in Museum Illuminated by Means of Semi-Indirect System With Diffusing Bowls.

ft. of floor space, depending upon the required intensity and the nature of the skylight. It is sometimes necessary to install a test installation and conduct considerable test work before a suitable equipment can be located to provide illumination that is both adequate and satisfactory for the particular needs.

Mural paintings and ceiling paintings often compose a part of the architectural design of the building and sometimes require special consideration in the design of the lighting system. Where the room is decorated with mural paintings the walls should be uniformly lighted to an intensity of about 6 foot-candles, and any sharp cut-off of the light should be avoided. Where the problem in question is the illumination of ceiling paintings cove lighting or cornice lighting will often prove to be a satisfactory method of lighting the work. Here small lamps of the 20 or 40-watt size are placed in individual reflectors concealed behind the cornice of the room and so directed as to light the work as nearly as possible uniformly.

Example of Reproduction of Original Features of Illumination.

The Metropolitan Art Museum of New York City has installed in one of its galleries a series of 22 ceiling paintings by Pinturrichio which are illuminated in a method more or less novel and hence worthy of mention. These panels were from the Plaza Del Magnifico in Siene and are famous works in the history of the Rennaissance decoration. As it was desired to show the works in as nearly as possible their original settings the possibility of a visible lighting system was at once out of the question as it would have detracted greatly from the general appearance of the room. Consequently some other method of lighting the room had to be devised, and so cove lighting was tried first but proved unsatisfactory. The room itself contains six cathedral glass windows located three on a side on opposite walls. Three 100-watt lamps were installed outside of each window, one at the top and one at each side, and these in turn were supplemented by means of a trough reflector placed at the bottom of the window and directed to throw the light upwards toward the ceiling. The trough reflector was equipped with 25-watt lamps. The cathedral windows of the room were really sub-windows, and in the daytime light came in through the regular windows and then through these secondary windows. A box-like structure was then built around each window and equipped with a curtain which could be drawn down, incasing the window and lamps in a small compartment. Thus, when it was desired to use the artificial lighting the curtain was drawn and the lights switched on and the light was reflected from the curtains back through the windows into the room, giving a pleasing soft effect simulating actual daylight.

There are many diversified problems of this nature which are continually arising which require special consideration and thus enable the illuminating engineer to show what an important tool light really is. Although the principles may appear simple when they are once worked out there are no hard and fast rules which can be laid down and which will result in a satisfactory solution of each problem. In fact, each installation presents new difficulties which must be carefully worked out by the lighting specialist in order that the most satisfactory solution may be had.

Direction of Light Plays Important Part in Illumination of Statuary.

Even though the sculptor may pick the choicest of material to work with, and may produce a piece of work of the finest detail, unless the work is exhibited under the proper light much of the effect is lost. In order that the minute details of a piece of statuary stand out as the sculptor meant them to it is of the utmost importance that adequate lighting be supplied. To bring out small details shadows are necessary, and they become troublesome only when they tend to produce false impressions.

The desirable density, sharpness and amount of shadow will depend upon the nature of the

work. Tragedy will demand sharp contrast and dense shadows, and such a masterpiece as the Loacön group or the head of the blind poet, Homer, will require very sharp shadows to bring out the tragedy expressed in the features. On

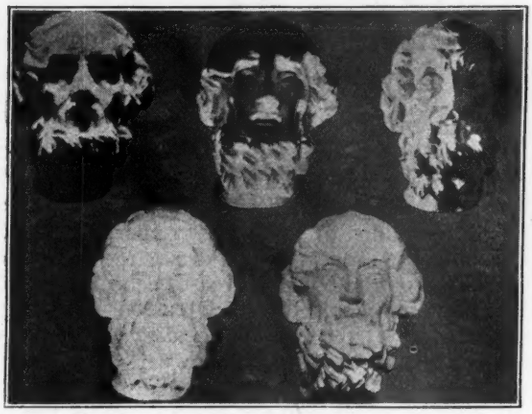


Illustration Showing Appearance of One Piece of Statuary Lighted From Different Directions.

the other hand, a piece of statuary like the head of Aphrodite, portraying soft, subtle modeling, and representing youth and happiness, will need a softer and more diffused light.

EFFECTS OF DIRECT LIGHTING ON STATUARY.

Thus we can see that the proper expression of a piece of statuary depends to a certain extent upon the nature of the lighting system. The effect of the direction of light upon a piece of statuary may be readily seen from the accompanying illustration. Here is a head of Homer which has been lighted from various directions to show the change obtained in the appearance of the work.

The sharpness and degree of shadow produced by a lighting system will depend upon the nature of the system. Direct lighting produces a maximum of sharp clear-cut shadows, giving the work a well defined appearance. However, if the direct system is equipped with bowl frosted or bowl enameled lamps, instead of the clear lamps, the sharpness of the shadows is decreased and a softer appearance is noted. If we proceed still further and employ a totally indirect installation a minimum of shadow is obtained and the work takes on a flat unattractive appearance, due to the lack of detail. Thus it is possible to control the density of shadows obtained by the selection of the proper lighting system.

In general, in lighting a statuary gallery, a system of the direct type will be found most desirable, although a semi-indirect system of light-density glass will do much towards adding a decorative touch to the room and at the same time give the desired result.

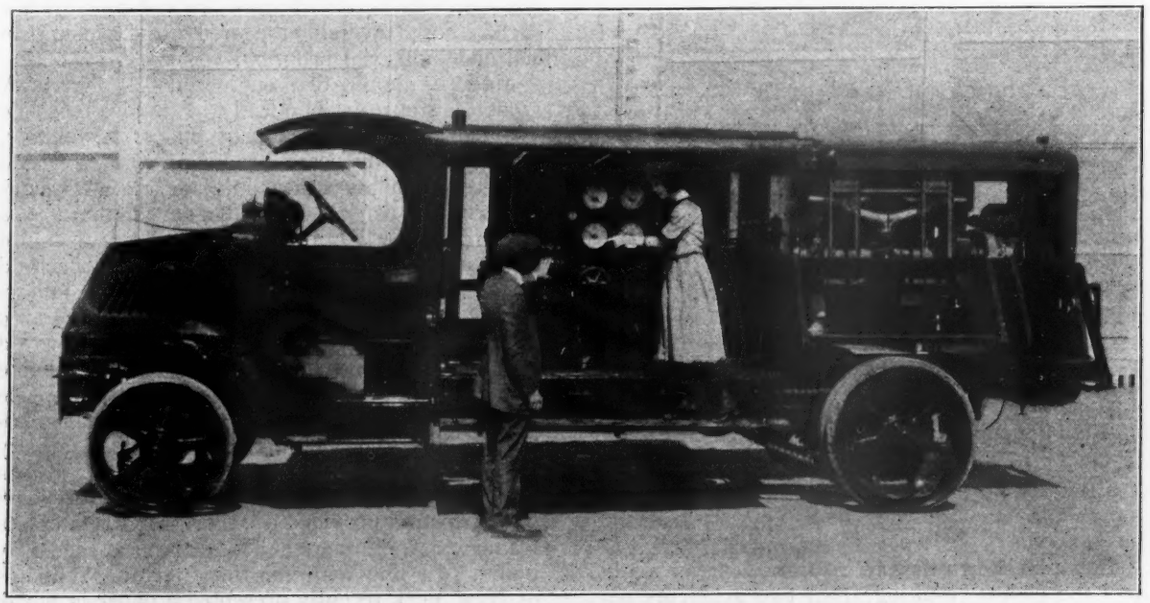
Thus it becomes apparent that light is an important factor in the correct presentation of works of art, and in making a comfortable and pleasing condition under which to study them. If correctly planned a lighting installation produces the effect the artist or sculptor strived so hard to obtain, but, on the other hand, if the system is inadequate it tends to spoil the effect and distract from the beauty of the building.

Note.—The first part of this article, dealing more particularly with painting galleries, appeared on page 375 of the Sept. 10, 1921, issue of Electrical Review.

PORTABLE POWER PLANT USED IN FILMING "THE CUP OF LIFE."

The "Ince Portable Generator," an electrical power plant built in the Thomas H. Ince Studios in California, was utilized to light exterior and night motion picture scenes during the filming of the recent Ince feature, "The Cup of Life."

The plant supplied sufficient power for 40 twin arc lights. It is mounted on a 3.5-ton Mack truck and equipped with a 210-hp. Seagrave gasoline motor and directly connected to a 100-kw. generator. The plant complete and ready for the field weighs 7 tons. Its mobility is equal to that of an automobile. Reeve Houck, its designer, is shown explaining its operation to Madge Bellamy, an Ince star in "The Cup of Life."



"Ince Portable Generator" Used to Light Exterior and Night Motion Picture Scenes.

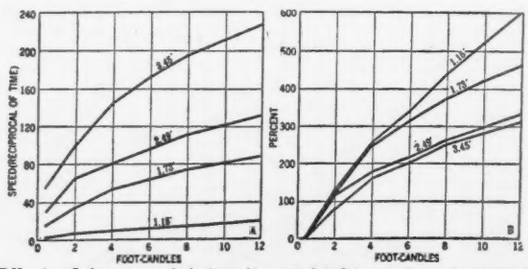
Problems of Theory and Practice in Modern Lighting

Extracts From Reports and Papers Presented Before Convention of Illuminating Engineering Society—Many Places Still Lighted Below Standards Known to Represent Satisfactory Conditions

As usual, the recent annual convention of the Illuminating Engineering Society, held Sept. 26 to 29 at the Powers hotel, Rochester, N. Y., resulted in the presentation of many new and interesting facts of importance in the field of practical illumination. The following comments, dealing with some of the subjects covered in the convention, were taken in substance from the various reports and papers that were presented.

Good Lighting of More Importance Than Cost or Amount of Energy Used.

The factory owner, when approached by the lamp salesman, should weigh carefully any argument in favor of a change in his lighting system which is based solely upon a resultant saving in energy consumption. Definite examples, presented at the convention, show how greatly the gain in increased output, due to good lighting, overbalances any possible saving in energy consumption effected by changes in the system of illumination. If the proposed new system sacrifices anything in the quality of illumination, or if it merely substitutes one inadequate system for another, it should be rejected, and the factory owner should insist that if his lighting installation is changed the new system must meet the requirements of good illumination even though this involves the consumption of more energy than before. First a good lighting system, and then as much economy in energy consumption as is consistent with the illumination requirements—such a policy is the wise one for the factory owner.



Effect of Increased Intensity of Light on Speed of Discrimination.

Accident insurance costs.—Compensation insurance premiums for a given plant are based on the amount of the payroll, and the rate is determined by the accident experience of a given industry modified by the experience of the particular plant under consideration. With a rate of 1% the annual premium in the case of 1000 employes at an average wage of $40 per week would be $20,800.

It can be shown that an insurance carrier might pay the claims resulting from two accidents per month (on an average) in this plant and meet his own overhead costs, and still have a slight margin of profit. An experience of three accidents per month, one-third of them due to poor lighting (a not unlikely event), would leave the insurance carrier no option but to increase the rate by 50%. The premium would then be $31,200—an increase of $10,400. If the lighting costs $3 per employe, or $3000 per yr. total, the owner's annual expense for poor illumination actually amounts to $13,400, of which $10,400 is required by the insurance company to meet accident claims. An expenditure of $6 per yr. per employe for lamps and energy might save a large portion if not all of the latter amount.—(Committee on Lighting Legislation.)

Improved Street Lighting Reduces Costs of Industrial Trucking.

While in the present state of the art it is not practical to provide artificial street lighting approaching actual daylight levels it is entirely feasible to increase the quantity of light to a level from 3 to 10 times as high as that provided by average existing systems, and when this is done with properly installed equipment it may be confidently expected that a large measure of the benefit of light in reducing accidents will be secured.

It is, perhaps, pertinent to emphasize that these higher levels of artificial street illumination, the expenditure for which is so amply justified as an accident prevention measure, have many other important advantages in contributing to the prevention of crime, to the comfort and convenience of all those traversing the streets, and to commercial and industrial progress.

Modern illuminating engineering has been of great assistance economically in making possible "double shift" operation of industrial plants, thereby in many cases reducing the overhead charges on the investment in plant and machinery by as much as 50%. In the development of a level of street lighting such as will enable night traffic at the same density, speed, convenience and safety as by day there is offered a similar important opportunity for community economy. Large as the expenditures are already for improved thoroughfares and highways, engineers estimate that at the present rate of traffic growth duplicate roadways must be built very soon in many districts. This congestion, however, will be greatly relieved and the time when duplicate road construction is required will be postponed for years in many cases provided a larger proportion of the traffic can be diverted from the crowded day hours. In line with this idea Arthur Williams of New York recently presented a paper in which reductions as great as 50% in trucking cost were

estimated to be possible by the increased utilization of equipment and terminal facilities and the avoidance of traffic delays by the use of streets during the less congested hours. It is apparent that the density of traffic which would result from such a "double shift" utilization of thoroughfares and highways would greatly increase the total of night accidents. Furthermore the greater density of traffic at night would undoubtedly result in a larger proportion than 17.6% of the accidents being chargeable to lack of light, unless adequate street lighting is provided. But the annual cost to the community of lighting entirely sufficient for safe and convenient night traffic is small indeed compared with the construction and maintenance cost of the additional roadways which will otherwise be required.—(Earl A. Anderson and O. F. Haas.)

Illumination of Municipal, County and State Buildings.

The larger portion of municipal, county and state buildings is devoted to private and clerical offices, the illumination of which has been thoroughly covered. Entrances, corridors and reception rooms are similar in demand to those in the museum, and where inscriptions and mural paintings are present care should be taken to see that the type of unit chosen for lighting permits these to be seen in a clear and effective manner.

Committee and jury rooms have the same general requirements as the office, although a lower intensity (3 to 5 foot-candles) is sufficient. In many instances, however, these rooms are finished in dark wood, which makes the lighting problem considerably more complex. Bracket units with unshielded lamps should be avoided, and diffusing inclosing globes well out of the angle of view offer probably the best solution. The character and design of the supporting fixture will depend on the elaborateness of the decoration.

Figuratively speaking, light and justice are always associated, and yet an investigation of the lighting in our court and assembly rooms shows them to be in many instances dark and dingy. When necessity arises for proving physical facts by visible evidence it is often difficult to observe the details of the exhibit. During a court trial it is certainly desirable that the judge and jury should see the witness with the utmost distinctness as testimony is being given, and it is evident that proper lighting is essential. Many of our court rooms are still illuminated by open burner gas jets, or by old gas fixtures which have been slightly altered to accommodate such electric lamps as would go inside the globe without any forethought from the standpoint of intensity, distribution or diffusion.

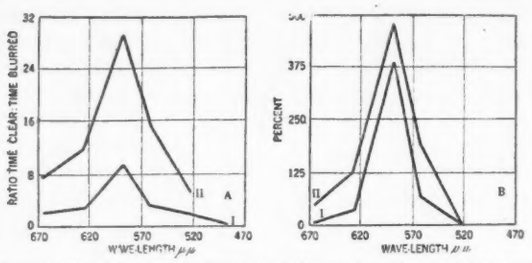
The general lighting requirements are similar to those of an auditorium, and lighting units should be suspended well out of the line of vision, even though of a decorative nature. Wall brackets at the front of the room are especially objectionable as they are continuously in the field of view, and one's attention is naturally directed toward the judge and witness.

While stage effects are not in especially good taste there is no reason why advantage should not be taken of some of the principles utilized so effectively on the stage. If the director desires to focus the attention of the audience on a particular part of the scene, or one actor, he illuminates this area to a higher intensity by the use of a spot lamp of some sort. If the construction of the building is such as to permit a suspension type spot lamp to be concealed from view it would seem fairly logical to direct the light from this lamp on to the witness stand. A sharply defined spot would not be desirable, but on the other hand one which shaded off gradually would produce the desired effect without being noticed by the casual observer.

There are many cases which come to trial where the verdict depends on a close examination

Industrial Establishments, Like This Clothing Factory, Need the Services of the Illuminating Engineer to Aid Production and Conserve Eye Sight.

of the evidence, as in the case of forgery, or an erasure in a document. Much time may be lost if the case has to be adjourned to an adequately lighted room in order to view the exhibit. If convenience outlets are provided to which local lamps giving a high intensity of illumination can be attached this work can be carried on without



Curves Used to Show Effect of Wave Length of Light on Power to Sustain Clear Seeing.

loss of time. The accurate type of color identification unit, providing illumination of a high intensity over a small area of a true daylight value, should be useful.—(A. L. Powell and Edgar Parker.)

Ventilation and Its Influence on Use and Operation of Gas-Filled Lamps.

Soon after the gas-filled lamp was introduced in the early part of the year 1914, criticisms began to be heard because of the greater amount of local heat developed. It will be remembered that the first gas-filled lamps introduced were the 750-watt and 1000-watt, 115-volt sizes and some of the low-voltage high-current lamps. The bulb which felt hot to the touch, the extreme brightness of the filament, and the extraordinary power consumption combined to make the fire hazard appear greater than it really was. In some districts local inspectors formulated rulings which were so strict that the installation of gas-filled lamps was greatly hindered. While the intent of these rulings was good the rules in most instances were made without authentic data which afforded a comparison with previous practice.

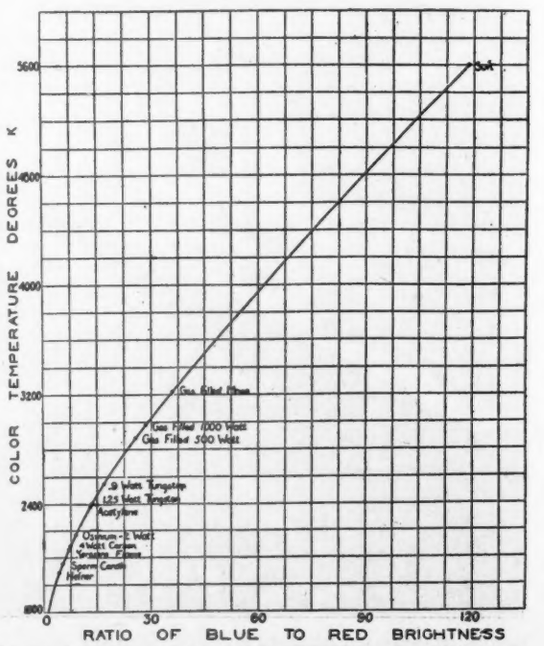
Almost invariably rules relating to the installation of gas-filled lamps contained somewhere a reference to ventilation, which was expected to lower the temperature of the exposed surfaces of the unit and at the same time prevent short life of the lamp due to excessive filament temperature. There is no doubt that ventilation, however slight, usually cools the lamp bulb and some other parts of the unit to a certain extent, but this is ordinarily accompanied by a corresponding rise in temperature of other parts. One of the most important considerations from the standpoint of the National Electrical Code is the temperature of the wire where it is connected to the lamp socket. A considerable amount of data already gathered indicates that ordinary ventilation does not always cool the wire and socket parts, but actually raises their temperature in many instances.

The erroneous impression that the life of an incandescent lamp is appreciably shortened by surrounding high temperature has also led manufacturers to ventilate in various ways. Theoretically, the filament temperature is increased by high surrounding temperature, but this increase is so small relatively at 4300 to 4800 deg. F., the range for regular gas-filled lamps, as to be unnoticeable even on carefully conducted life tests. The melting point of tungsten is given as 6156 deg. F., so that there is a considerable margin between the operating temperature and the melting point of tungsten. Tests also show that the high surrounding temperatures which are encountered in special cases effect the lamp performance by causing a blistered bulb, loose base, melted solder, trouble at the stem seal, etc., before they produce any serious effect upon the filament.—(Chester L. Dows and Willard C. Brown.)

Importance of Maintenance of Equipment in Good Operating Condition.

Proper and adequate maintenance of equipment for both natural and artificial lighting is essential. Systems which are adequate when first installed will soon deteriorate below this level unless properly maintained. The factory owner should establish a regular definite system of maintenance to insure that sky windows, side windows, lamps and accessories are at all times kept clean, in proper adjustment and in good repair. Means should be provided for easy access to all lighting units by the employe in charge of their maintenance. Walls and ceilings should be repainted, preferably in light tones, at regular intervals, particularly where, as in indirect systems of lighting, a large part of the illumination comes from the ceiling. It should be kept in mind that the illumination requirements given in the tables apply to the lighting equipment under adverse operating conditions, not simply new and clean as when first installed.

To insure that a given level of illumination will be maintained even where conditions are favorable, it is necessary to design the system to give initially at least 25% more light than the required minimum. In locations where the dirt will collect rapidly and where adequate maintenance is not provided the initial value should be at least 50% above the minimum requirement, and it is evident from a study of the available data that even this allowance may prove insufficient.



Curve Showing Color Temperatures of Various Illuminants.

Especially in connection with the maintenance of lighting systems attention is called to the desirability of having available in the factory some instrument with which the foot-candles of illumination received at any point, can actually be measured. There are a number of such instruments on the market, some of which in the hands of experienced men are capable of a high degree of accuracy. One instrument, the foot-candle meter, is not designed for precise measurement, but, nevertheless, has a considerable field of usefulness because its determinations are accurate enough for many practical purposes. The foot-candle meter is small, light in weight and does not require technical training for its operation.—(Committee on Lighting Legislation.)

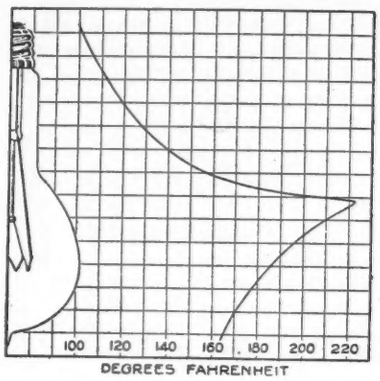
Effect of Variations on Ocular Functions Found by Experiment.

An inspection of a chart presented with one paper shows that the ocular functions most affected by the change of wave-length are, in order from greatest to least, the power to sustain acuity, speed of discrimination, and, lastly, acuity. So far as the writer has been able to tell from all of the work up to the present time this order of ranking holds in general for whatever effects the functional powers of the eye—errors of refraction, favorableness or unfavorableness of working conditions, bodily health and fatigues, etc. From the standpoint of testing, therefore, the power to sustain acuity affords the most sensitive basis, and the conventional acuity test the least sensitive basis for detecting small functional disturbances in the eye, whether they are due to errors in refraction or any of the causes mentioned above. Speed of discrimination, however, is a very sensitive test and is much more feasible for general laboratory purposes than the regular test for power to sustain.

With reference to the problem of the coloration of paper this study shows the wave-length, hue (which is a subjective aspect of both wave-length and intensity), and saturation (which is also a function of wave-length and intensity) are important factors governing the working powers of the eye. Further analysis, however, is needed. Obviously, an important point yet to be determined is the relative significance of hue and saturation. In other words, how much effect is there for difference in color when the working surfaces are equalized in saturation and brightness, and conversely how much effect is there for difference in saturation when hue and brightness are made equal? For example, it is quite possible to make papers of different hues and of approximately the same saturation and brightness. What would be the difference in the working powers of the eye under these conditions? We have already made the determination (results as yet unpublished) for fairly well saturated red, yellow, green and blue (mixed lights) with regard to tendency to produce ocular fatigue and discomfort, and have found a very considerable difference. Later this determination will be made for acuity, speed of discrimination, and power to sustain acuity.—(E. C. Ferree and Gertrude Rand.)

UNIT	LAMP	DEGREES FAHRENHEIT			
		TEMPERATURE OF BULB (MAXIMUM)	TEMPERATURE OF WIRE IN CONDUIT	TEMPERATURE OF BULB OPPOSITE FILAMENT	TEMPERATURE OF BULB AT JUNCTION OF BRASS AND GLASS
	200-WATT TYPE C2	492	168	394	258
	500-WATT TYPE C2	542	240	438	356
	200-WATT TYPE C2	365	155	345	226
	200-WATT TYPE C	392	140	284	231
	300-WATT TYPE C	385	178	298	228
	1000-WATT TYPE C	569	174	474	348
	200-WATT TYPE C	324	142	284	238
	300-WATT TYPE C2	458	164	393	278
	500-WATT TYPE C	530	147	494	343
	300-WATT TYPE C2	424	165	376	292

Chart Showing Operating Temperatures of Various Inclosed Units.



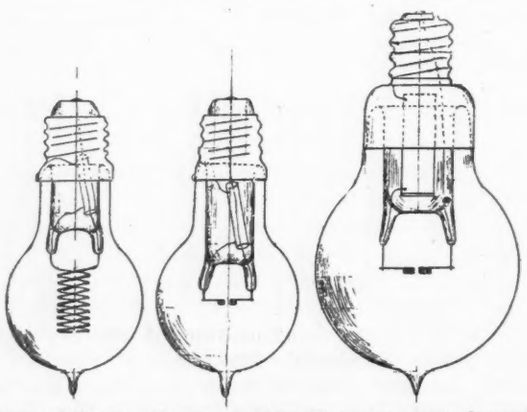
Temperature Gradient on Bulb of 100-Watt Type C Lamp.

Influence of Radiation on the Eye and Its Operation.

The only light sources from which there seems to be any material danger to the eye from the standpoint of thermic effects are certain very powerful high-temperature sources used in the arts, such as heavy arcs used for welding purposes, furnaces (electric or other) where there is customarily great concentration of energy, and such purely accidental phenomena as short-circuits. Perhaps some of the very powerful arcs used in searchlights might be included in this class of the possibly dangerous. Ordinary discretion in avoiding disagreeably powerful lights, or suitably shading the eyes from them, should avert easily all real danger from any of these sources of radiation, save the short-circuits which are accidental rather than ordinary risks. Certainly, no sources used for lighting purposes can be classified as dangerous from the standpoint of thermic effects.

It is desired particularly to emphasize the fact that so far as any possible temporary or permanent injury to the retina is concerned such action must depend on the concentration of energy in the image. Consequently, extended sources of moderate intrinsic brilliancy are to be preferred to intense sources. Hence it is desirable to protect all sources naturally of high intrinsic brilliancy by diffusing globes.

As regards dangers of injury to the eye from light radiation, as such, experiments indicate that it has been very greatly exaggerated as regards its pathological possibilities. It is undoubtedly true that brilliant sources of light are disagreeable and that they produce unpleasant effects in temporary scotomata, disturbance of color vision, persistent and annoying after images and fatigue due to efforts to overcome the difficulties of vision under these disadvantages. As regards definite pathological effects or permanent impairment of vision from exposure to the luminous rays alone we have been unable to find either clinically or experimentally anything of a positive nature. As for the ultra violet part of the spectrum, to which exaggerated importance has been attached by many recent writers, the situation is much the same as with respect to the rest of the spectrum; that is, while under conceivable or realizable conditions of over exposure injury may be done to the external eye yet under all practical conditions found in actual use of artificial sources of light for illumination the ultra violet part of the spectrum may be left out as a possible source of injury. All illuminants possess an easily measurable amount of ultra violet radiation ranging, as has already been shown, from about 4 ergs per sec. per sq. cm. per foot-candle of illumination in the quartz arc with the usual globe, to more than 20 times this amount in the inclosed carbon arc shining through a quartz window. Between these two lie the whole range of incandescent lamps, both gas and electric, the ordinary mercury arcs and the ordinary Cooper Hewitt tube, flames, arc lamps of various sorts and sunlight. The last mentioned occupies an intermediate position be-



Three Different Types of Neon-Tungsten Incandescent Lamps.

tween the high-efficiency electric incandescent lamps and the older incandescent lamps or ordinary flames.

No injurious effects have been attached with any reasonable degree of certainty to the ultra violet radiation which lies between the end of the visible spectrum and the beginning of the abiotic rays. Since this range of radiation is present in considerable amount in ordinary sunlight it is sufficiently obvious that any definitely harmful results producible under ordinary conditions would have been eliminated by the ordinary progress of evolution. Artificial illuminants under any practical conditions of use expose the eye to much less severe radiation in this part of the spectrum than does ordinary daylight.

With respect to abiotic radiations we have every reason to acquit on sound experimental basis every known artificial illuminant when working under ordinary conditions of commercial use. The only sources used in the arts which have abiotic power enough to require special caution in their use are those not employed for the purpose of illumination. Our general conclusion, therefore, regarding the effect of radiation from practical illuminants on the human eye is that no sources commercially employed for such a purpose are to be regarded as dangerous, and that the most ordinary care in *providing illumination with which comfortable vision can be obtained* is sufficient for complete security against all possibility of injury from radiation.—(F. H. Verhoeff and Louis Bell.)

Facts of Importance in Regard to Relief of Eye Fatigue in Industry.

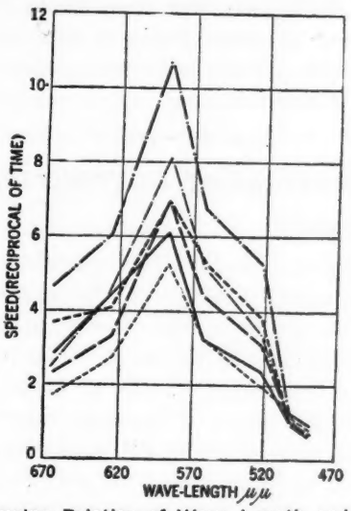
Insufficient illumination represents an abuse of the eyes, and a careful regulation of the illumination in our factories, offices, homes, etc., should be observed in order to support our eyes in their functioning. How can this best be accomplished? The answer must be: "Study Daylight Effect." The following specific points are cited: (1) Dark corners should be illuminated with diffused indirect light of sufficient intensity to prevent excess of contrast of all illuminated objects in areas surrounding them. (2) The eyes should not be exposed to direct light sources of any kind. (3) The excess of the yellow light from most of our artificial light sources should be neutralized by blue filters of suitable tint in order to approach daylight color. It is not necessary to obtain absolute standard daylight quality as determined spectroscopically, since our light sense overcomes a considerable variation of color combinations in the light source without experiencing fatigue. (4) When work is to be done on bright light-reflecting surfaces the illumination should be as much as possible of a grazing incident so that the light rays may not reflect direct into the eyes of the worker. (5) Cheerful surroundings, well illuminated, add a great deal to the comfort of the individual—remember that seeing is a nerve action. (6) Attractive soft color schemes of variety in work rooms will prove to be refreshing to the eye; monotony in color should be avoided. (7) Neither red walls nor pure white walls are inviting; the former tend to fatigue, the latter glare and tire the eye. Neutral gray as a base color is restful to our eyes, while bright multiple color effects are exciting. (8) Fine detail work does not demand brilliant illumination; a soft velvety light of moderate intensity will prove far more satisfactory in order to prevent eye fatigue. For extreme fine detail work optical appliances should be made use of in order to magnify the images of such objects on the retina; illumination alone will not suffice. The illuminating engineer should

also make frequent use of the spectroscope in testing light sources since one cannot judge by tint only.—(Max Poser.)

DEFINITIONS ADOPTED BY COMMITTEE ON NOMENCLATURE AND STANDARDS.

The following definitions have been adopted by the Committee on Nomenclature and Standards:

Luminous Flux is the rate of flow of radiant



Curves Showing Relation of Wave Length and Speed of Discrimination (Six Observers).

energy evaluated with reference to visual sensation. Although *luminous flux* must strictly be defined as above, it may be regarded for practical photometric purposes as an entity, since the rate of flow is for such purposes invariable.

The unit of *luminous flux* is the *Lumen*. It is equal to the flux emitted in a unit solid angle by a uniform point source of one international candle.

Illumination at any point of a surface is the *luminous flux* density at that point, or, when the *illumination* is uniform, the flux per unit of intercepting area.

The practical unit of *illumination* is the *Lux*. It is equal to one *lumen* per sq. m., or it is the *illumination* at the surface of a sphere of 1 m. radius due to a uniform point source of 1 international candle placed at its center.

As a consequence of certain recognized usages, the illumination can also be expressed by means of the following units:

Using the centimeter as the unit of length the unit of *illumination* is 1 *lumen* per sq. cm., and is called the *Phot*. Using the foot as the unit of length, the unit of *illumination* is 1 *lumen* per sq. ft., and is called the *foot-candle*.

The Luminous Intensity (Power) or Candle Power of a point source in any direction is the flux per unit solid angle emitted by the source in that direction. (The flux from any source of dimensions which are negligibly small by comparison with the distance at which it is observed, may be treated as if it were emitted from a point.)

The unit of *Luminous Power (Intensity)* is the *International Candle*, such as has resulted from international agreement between the three national standardizing laboratories of France, Great Britain and the United States in 1909.

This unit has been conserved since then by means of incandescent electric lamps in the laboratories which continue (or remain) charged with its conservation.—(Committee on Nomenclature and Standards.)

PARIS MEETING OF INTERNATIONAL ILLUMINATION COMMISSION.

The recent meeting of the International Commission on Illumination, in Paris, marked in a way the real beginning of the Commission. In 1913 the Commission was organized at Berlin out of the International Photometric Commission. This latter Commission had been created by the Gas Congress of 1900 at Paris and had had a dozen years of useful service in promoting international agreement, particularly in the photometry of gas lamps.

The newer commission was organized as a more representative body of all lighting interests, and on a somewhat broader basis. It was intended that the Commission should convene every 3 yrs., and the second meeting was scheduled to be held in Paris in 1916. On account of the war it was impossible to hold this meeting. Moreover, the formation of national committees was retarded and the complete organization of the Commission was not consummated. It, therefore, became necessary when the war was over to proceed with the organization on a slightly different basis and the meeting in Paris, held some weeks ago, was the outcome.

The following countries were represented: France, Great Britain, Italy, United States, Switzerland, Belgium and Spain. The national committees of Great Britain, France, Italy and the United States submitted papers or technical reports as the basis for discussion and international action. The presentation of papers on various live subjects of illumination was most gratifying, for it inaugurated a policy of broader activity and usefulness than could ever be achieved if the work of the Commission were restricted to questions of international standardization. In all, approximately, 15 papers and technical reports were presented.

One of the most important subjects before the Commission was that of nomenclature and standards. The decisions of the international body on this subject were restricted to the definitions of the three fundamental quantities, "Luminous Flux," "Illumination," and "Luminous Intensity," together with the corresponding units. This would seem to be but a meager accomplishment, but in view of the difficulties encountered among the various nations with respect to their viewpoints and their practices the accomplishment is significant. The foundation of international agreement on nomenclature and standards has been laid and through the activities of a committee which was appointed with M. Blondel as chairman, it is expected that a much fuller report will be prepared for adoption at the next meeting of the Commission 3 yrs. hence.

The following officers were elected: President, Dr. E. P. Hyde; honorary president, Th. Vautier; vice-presidents, M. F. Rouland, M. G. Semenza and Major K. Edgcumbe; honorary treasurer, C. C. Paterson; honorary secretary, C. C. Paterson, and assistant secretary, J. W. T. Walsh.

EDITORIAL COMMENT

Street Lighting

Street lighting is the oldest branch of the electric lighting field, and probably the most conservative. One reason for this is that it is largely dominated by municipal authorities, and our municipalities are proverbially almost penurious with their street-lighting as well as with other appropriations. As a result rapidly progressive developments are not to be expected. Therefore no radical changes were made in the character of street-lighting circuits for a great many years until the adoption of the tungsten incandescent lamp in place of the obsolete types of arc and carbon-filament lamps became quite general. It was then realized that the standard series constant-current circuit was no longer essential and in many cases could with considerable advantage be replaced by a modification thereof incorporating certain features of multiple distribution. Such composite circuits, as well as occasionally straight multiple circuits, therefore came into some vogue.

It is still too early to effect a general standardization of circuits. Each of the three principal types has advantages that adapt it for particular service and it is therefore very likely that we shall find each type used for many years to come. It is just as certain, however, that in the future we shall see greater use made of multiple and of mixed or composite systems, especially the latter, because of their greater safety as compared with straight series systems.

The use of the straight multiple and of certain of the composite systems would rapidly increase if there were available a simple, relatively inexpensive and dependable method of effecting remote control. Several methods are already developed, but in the opinion of some engineers further development in this line is hoped for. It is not doubted but that such development will take place so that the street-lighting circuits of the future will not have to be brought back to the power house or substation for control purposes nor be dependent on manual patrolling.

An objection against straight multiple systems is that on long branches the potential drop is quite heavy at the remote end of the branch, and the distant lamps consequently do not receive the proper voltage unless great care is exercised in selecting lamps of progressively lower voltage from the beginning to the end of the circuit. This is a valid objection where the branch must be fed from one end. It is frequently possible, however, to feed one side of the circuit or branch from one end and the other side from the other end, this being especially true where a branch runs around an entire block or two and is fed from a trunk circuit on a main street passing many such block circuits.

The Illuminating Engineering Society

In the lighting branch of the electrical industry the Illuminating Engineering Society takes its place as the leader in both theoretical and practical research and development. The Society at its recent convention, details of which are reported on other pages of this issue, took up many subjects of purely theoretical interest insofar as the present development of the art is concerned. The report of the Committee on Progress contained many interesting examples of recent research and development, and it is probable that many of the subjects that are now of only technical interest will develop into practical propositions in the future. The following quotation, taken from this report, reviews studies made in regard to skylight:

"By combining with the Angström pyranometer a recording device consisting of a lamp, galvanometer and a rotating photographic film, upon which the deflections are traced, continuous records have been obtained of sky brightness. For more than 10 yrs. such measurements have been made at Washington, D. C., with the pyrheliometer. The above instrument checks very well with results obtained by the latter. The relative intensity throughout the visible spectrum of light from the zenith and various parts of the sky at different times of day from dawn onwards and under various atmospheric conditions—cloudy, misty and dull—has been measured at Sestola (1090 m. above sea level) by a spectrometer using an acetylene flame as a standard. The light was found to be selective, having a decided preponderance of blue. It appeared that a pronounced reduction in the extreme violet was associated with the condensation of aqueous vapor. By making photographic exposures under colored filters selected to isolate various parts of the spectrum information has been obtained as to the chromatic character of the light from the night sky. It was concluded that the night sky was much yellower or less blue than the (clear) day sky. Comparison with direct sunlight or moon-

light showed that the night sky was of the same color quality as these. The conclusions favor that theory which regards the general light of the sky as an extension of the zodiacal light and not due to the scattering of sunlight by rarefied gas situated beyond the earth's shadow.

"Data have been obtained on the spectral transmission of the atmosphere for three types of weather conditions—(1) clear and cold, (2) overcast with high humidity, and (3) rainy. Light from an incandescent lamp was reflected by a mirror 600 m. distant and the intensity of this reflected light was compared by means of a spectrophotometer with the intensity of a beam directly from the lamp. The "clear and cold" condition gave slight evidence of selective absorption in the visible spectrum. The other two conditions gave a decrease in transmission for wave lengths less than 0.54 μ. In the rest of the visible spectrum the overcast and high-humidity atmosphere gave curves having two maxima and a minimum, which are entirely lacking in curves for rainy weather. In all cases there appeared to be a reduction in transmission as wave lengths increase above or decrease below certain values, the maximum of relative transmission falling within the range of vision."

Along with such studies as this the Society takes up the very practical questions involved in the design and manufacture of equipment, the determination of industrial, street and home lighting standards, and many other questions of vital importance to the consumer as well as the producer of electric lighting service. The Society deserves the hearty support of the industry.

The Electric Sign

It is hard to overestimate the importance of sign lighting as a factor in the electrical industry. "It pays to advertise" is a slogan expressing a truth that is now taken as axiomatic. The one interesting feature of the electric sign which many electrical men have failed to see is that it advertises the electrical industry just as well as it advertises soap or tires or any other commodity pictured or named in the display. Thus, the sign not only brings in a revenue to the sign manufacturer and contractor, the central station, the lamp manufacturer and the manufacturers of sockets and wire, but it also advertises the electrical industry. In addition to creating a need of equal or superior display in the interests of a competing merchant or product, as viewed only from the industrial angle, the sign holds before the man in the street an ever-present evidence of the service rendered by electricity.

As a producer of central-station load the electric sign is probably the equal, for quality of business, of any lighting load. The sign is lighted early and remains in service until late. It represents practically a 100% load during its hours of service. As a load producer the sign has developed with great strides. It is only a short time since lamps of 5 or 10-watt capacity were considered suitable for general use, while now it is not unusual to use 100-watt lamps in great numbers in a single display. In addition to the increase in lamp sizes the size and number of signs have been greatly increased.

Every branch of the electrical industry should boost the sign. It pays revenue directly to some branches, but it is strictly impartial in advertising electric service. It is electric service that brings revenue into each branch of the industry. Boost the sign.

Electric Means of Measurement

Attention has been called upon many occasions to the powerful tool which electrical methods of measuring put into the hands of workers in many fields. For example, possibly the most important advance of recent times in furnace operations has been the adaptation of electrical methods of temperature measurement. Heretofore the temperature of a furnace has been determined by guess, and satisfactory working has been dependent to a large degree upon the experience of the man in charge. Now, while the value of experience has not been in any way diminished, electrical pyrometry has made possible accurate temperature determination and control. Only recently was noted the employment of an electrical method in another art, that of testing materials, which promises to be of great importance. Not infrequently other new uses are pointed out.

There are several reasons for this. One is the highly developed state of the art of electrical measurement. This started first with the physicist and has been followed up by the engineer who was forced to it, since the commodity in which he deals is unweighable and invisible and he was forced to develop satisfactory measuring apparatus. Later he became aware of the great importance of the accuracy of his instruments, and carried the art to a high degree of perfection. This development has not been without marked influence on methods of measurements used in other branches of science and engineering, even when the measurements are made by other means.

Another reason for the increasing use of electrical means for measurement is the exceeding sensitiveness of certain of these means. For example, the spectroscope is frequently referred to as the most sensitive scientific instrument. By means of it the chemist can detect the presence of elements in quantities far too small to be weighed, but a delicate electroscope may be several hundred thousand times more sensitive than

the spectroscope, and besides this it is a quantitative instrument while the spectroscope is only qualitative.

But one feature of electrical methods of measuring which will surely have great influence in extending them is the fact that the effect to be measured may be produced at one point and measured accurately and conveniently at another. The effect on a thermocouple placed in a furnace may be measured by a galvanometer set off at a distance. The lengthening of a sample of metal under test is determined by measuring its resistance by an instrument placed where it is out of the way and unaffected by any happening at the testing machine. The speed and even the acceleration of a railway car can be read directly, without necessitating the use of a watch, by an observer seated comfortably at a table in the car itself. This feature, the ease with which the action to be observed can be made to produce an effect some distance away, is one which is sure to lead to an even wider extension of electrical methods of measuring into many new fields.

The Telephone in Railroad Operation

Application and development of the telegraph system invented by Prof. Samuel F. B. Morse, in 1844, and the telephone system invented by Prof. Alexander Graham Bell, in 1876, have made these two methods of communication of incalculable benefit to mankind and invaluable to the progress of civilization. Many commercial enterprises owe success to their utilization. Perhaps one of the most noteworthy uses of the services of these two systems has been in the field of railroad train dispatching.

From 1830, when the first successful train was operated over the Baltimore & Ohio lines, to 1850, train dispatching was solely the maintenance of a "time-interval" system which prevented trains from meeting each other head on or meeting at some point where neither could pass the other. However, by the latter year success of the telegraph in handling commercial messages so attracted the attention of railroad men that one superintendent conceived the idea of applying it to train dispatching. Within a year a practical telegraph dispatching system had been developed and, from that time until the latter part of 1907, nearly all train movements were directed by means of the telegraph.

The telephone had for many years been recognized as an indispensable asset in the economic and efficient conduct of both large and small business undertakings and it is not surprising that it received consideration for railroad work at this time. With the production of the selector shortly afterwards the telephone was adopted for railroad dispatching work and the results were most satisfactory.

According to statistics compiled by the Interstate Commerce Commission, on Jan. 1, 1918, there were in the United States 633 railroad systems, operating 244,356 mi. of road, employing the telegraph or telephone in the transmission of train orders. Of this number, 162 systems used the telegraph exclusively for the work, while 317 systems preferred the telephone solely. On the former there were 31,354 mi. of telegraph and on the latter, 23,644 mi. of telephone line. The telegraph and telephone were used jointly on 154 systems operating 220,305 mi. of road and the telegraph mileage was 110,891, against 82,720 for the telephone.

Steam railroads over which both passenger and freight trains are moved, high speed electric traction systems, industrial roads, such as those used for hauling ore in mining districts, and practically every type of railroad, have adopted either the telegraph or telephone method for train dispatching. Nor is its use confined to the United States and Canada but, rather, employed throughout the world. On March 1, 1914, 16 railroads operating in foreign countries had installed over 1300 mi. of telephone for train dispatching.

Swiss Market

Although there are many large and long-established electrical manufacturing concerns in Switzerland and in some of the neighboring countries, there is undoubtedly a market for up-to-date American apparatus for use in connection with the rapidly growing field of power generation and distribution. There is at the present time a large demand for all kinds of electrical machinery together with auxiliary apparatus, such as lightning arresters and other protective and controlling devices. Switzerland is the one country on the continent of Europe which has made great progress in the matter of electrical development during the last few years. The difficulty of obtaining coal has led to exceptional activity in developing new hydro-electric sites and distributing the energy from these sites to the industrial centers.

Railway electrification has made great strides, and a large number of concessions for new electric power plants have recently been granted. These include the important developments on Lake Lungern and the Bernese power works.

The variety and number of these new schemes together with the renewed industrial activity in Switzerland suggest the advisability of American manufacturers giving careful thought to the possibilities of doing business in that country at the present time or in the immediate future.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

LIGHTING FIXTURE MEN PLAN BIG THINGS AT MILWAUKEE.

National Council of Lighting Fixture Manufacturers Decides Upon General Plan to Bring Fixture Market Before Electrical Industry.

At the meeting of the Executive Committee of the National Council of Lighting Fixture Manufacturers in Cleveland recently a general plan was decided upon with regard to the advertising and other methods whereby the Fixture Market, joint convention and Better Lighting Week to be held at Milwaukee, Jan. 30-Feb. 4, may be brought prominently before the electrical industry and the buying public in general.

Charles H. Hofrichter, secretary of the National Council, has sent out the following announcement from the Cleveland headquarters:

"THE MARKET THAT MAKES MILWAUKEE ELECTRICALLY FAMOUS."

That is what lighting fixture makers and dealers, and everyone else who is interested in better lighting—and which of us is not?—will be saying from now till Jan. 30, and for a long while afterwards, too. For on Jan. 30, 1922, the National Council of Lighting Fixture Manufacturers, the Dealers' Society of America and the Illuminating Glassware Guild will hold their third annual Lighting Fixture Market and their second joint convention at the Milwaukee Auditorium.

From Jan. 30 right up to the closing date, Feb. 4, there will be "something doing" every minute. The mornings will most probably be devoted to the convention meetings and the afternoons to the Fixture Market, just as at the highly successful Fixture Market at Buffalo last February.

In addition to the above-mentioned events there is to be a "Better Lighting Week" to be held during the convention. Demonstrations of better lighting methods for homes, offices and industrial plants, together with free surveys and reports on improvements possible in existing lighting installations—these and many other features will show the people of Milwaukee the road to more efficient and artistic illuminating methods.

Last, but by no means least in its spectacular attractive appeal to the public, is the "pageant of light," a wonderful reconstruction of the progress of lighting fixtures and methods from the flaring torch of the caveman to the artistic illuminating equipment of today.

To all those interested in better lighting the convention week at Milwaukee will be full of instruction, amusement and interest—particularly to electrical men. So make a note in your diary, "Be at Milwaukee Jan. 30 to Feb. 4, 1922."

GIVING CREDIT WHERE CREDIT IS DUE.

A leading manufacturer of lighting fixtures who has just participated in a large order of cable for electrical equipment states that the foreign buyer had the material brought to his attention by an announcement in the ELECTRICAL REVIEW. Thank you, Mr. Manufacturer, for telling us! There is too little of a disposition on the part of advertisers to give proper credit to the papers in which their announcements appear; but, if they would only realize it, any journal which is faithfully trying to serve its field can do better work if it meets with proper encouragement and appreciation rather than the reverse. The ELECTRICAL REVIEW has recently received some very nice letters from advertisers, both large and small, telling of the results obtained from using its pages and we certainly value these expressions. They will incite us to better and better editorial effort and in that way lead to increased benefits for the advertisers themselves.

H. A. BEST REPORTS GOOD ORDERS FOR NEW LAMP.

Quality Product Offered to the Trade at Moderate Prices Proves Attractive to Contractor-Dealers Wherever Shown.

The H. A. Best Lamp Co., 3236 West Grand avenue, Chicago, has developed a new table lamp—the first of a line of quality fixtures—that is to be manufactured and marketed under a most progressive plan. Orders now in hand, according to Mr. Best, will keep the factory busy for some time. Both the manufacturing and selling plans are calculated to produce a lamp of good quality at a price that will be attractive to the prospective purchaser and profitable to the contractor-dealer. From the orders already received it appears that both objects have been attained.

Mr. Best, who is also associated with the Henkel & Best Co., and with the Lincoln Brass & Spinning Works, both of Chicago, says that another lamp will be brought out in about 60 days, with others following at intervals until the line is complete. It is not the intention to produce a large number of units, but to produce only enough to make a complete line of good products. Such a policy, Mr. Best says, will result in plenty of business because of the high quality and moderate prices that may be maintained.

INTERNATIONAL WIRELESS ORGANIZATION PLANNED.

According to late reports from the French capital, an international wireless company for the control and development of the greater part of the world's radio facilities is in process of organization in Paris by representatives of wireless interests of Great Britain, France, Germany and the United States. The American delegation is headed by Owen D. Young, vice-president, General Electric Co., and includes Edward J. Nally and J. W. Elwood, president and secretary, respectively of the Radio Corporation of America. The Westinghouse interests are also represented.

The proposed agreement is the outgrowth of a desire of the four countries to place wireless on a sound commercial basis. The governments concerned have approved the conference and, it is

understood, will back the organization which is expected to be formed. Wireless facilities of the four countries will, in effect, be pooled, but each country under the plan will retain control over its respective territory. It has been estimated there are about 150 wave lengths in the world, and one of the problems of the present meeting is to divide these waves. Another aim is to make wireless available for the daily transmission of world news, assuring to news interests the same certainty of delivery as cable companies now are able to give, but at lowered cost.

ILLUMINATING ENGINEERS' ANNUAL CONVENTION BIG SUCCESS.

Three Days' Meeting at Rochester Characterized by Presentation and Discussion of Many Subjects Applicable to Illumination Field.

The 15th annual convention of the Illuminating Engineering Society held at the Powers hotel, Rochester, N. Y., Sept. 26-29, was characterized by the presentation and discussion of many subjects pertaining to the illumination field. Over 200 illuminating engineers attended and the consensus of opinion was that the convention was one of the most successful ever held by the Society.

The official opening of the convention took place Monday afternoon, Sept. 26, with R. M. Searle, chairman, General Convention Committee, introducing the secretary of the mayor of Rochester, who extended to the members of the Society a hearty welcome to the city. Then Gen. Geo. H. Harries gave his presidential address, which was informal in character, while the report of the general secretary, C. L. Law, showed an increase in the sustaining membership from 56 to 87 and the total number of members and associate members remained practically the same. F. E. Cady, as chairman, reported for the Committee on Progress, and in an informal manner Dr. C. H. Sharp rendered the report of the Committee on Nomenclature and Standards. Edward P. Hyde spoke on the Paris meeting of the International Commission on Illumination, and in the discussion which followed many emphasized the desirability to have some term such as the suggested word "luminaire" to denote lighting fixture or unit.

In the absence of L. B. Marks, chairman, Committee on Lighting Legislation, the report was given by G. H. Stickney, and E. L. Elliott, L. Bell, Dr. E. P. Hyde, S. G. Hibben, H. W. Davison and Ward Harrison took part in the discussion.

The morning session of Sept. 27 was presided over by W. J. Serrill. The paper on "The Effect of Variations of Visual Angle and Intensity and Composition of Light on Important Ocular Functions" by C. E. Ferree and Gertrude Rand was read by the former and discussed by D. M. Moore, L. Bell, E. L. Elliott and C. E. Ferree. Just before adjournment, Max Poser gave his paper on "Eye Fatigue in Industry."

Discuss Color Temperature and Brightness of Various Illuminants.

With Dr. C. H. Sharp presiding, the afternoon meeting opened with the report on "Sky Brightness and Daylight Illumination Measurements" by H. H. Kimball, chairman, Committee on Sky Brightness. It was discussed by E. C. Crittenden, E. L. Nichols, A. L. Powell, L. Ball and F. E. Cady. The paper on "Some Properties and Limitations of Optical Material" by W. B. Rayton, which had been scheduled for the morning session, was then presented and discussed by L. Bell, Max Poser, and G. S. Crampton. Dr. Gage, E. L. Nichols, C. F. Scott and J. B. Taylor spoke during the discussion of the paper on "Color Temperature and Brightness of Various Illuminants" by E. P. Hyde and W. E. Forsythe,

Members and Guests in Attendance at Fifteenth Annual Convention of

while the paper entitled "Incandescent Lamp Temperatures as Related to Modern Lighting Practice" by W. C. Brown and C. L. Dows was discussed by the latter and M. Macbeth and H. W. Davison.

S. G. Hibben presented the report of the Code of Fixture Design and Installation Committee to Co-operate with Fixture Manufacturers before the close of the Tuesday afternoon session, and C. H. Hofrichter, C. E. Scott and G. H. Stickney made some interesting comments.

On Tuesday evening with Gen. Harries presiding, E. Newton Harvey demonstrated his paper on "Animal Light" by experiments on luminous dried fish, and "Luminescence as a Factor in Artificial Lighting" by E. L. Nichols closed that meeting's program.

Consideration of automobile and motor vehicle headlighting and road illumination consumed the greater part of the morning session of Sept. 28, at which Preston S. Millar presided. The following papers were presented: "Present Status of Automobile Headlighting Regulation" by Dr. C. H. Sharp, chairman, Committee on Motor Vehicle Lighting; "A Determination by Various Drivers of the Desired Road Illumination From Automobile Headlamps" by H. H. Magdsick and R. N. Falge, and "Motor Vehicle Headlighting in Massachusetts" by A. W. Devine. Also the "Theory of the Flicker Photometer and Paints for Intergrating Spheres" by A. H. Taylor, and the "Interlaboratory Photometric Measurements of Gas Filled Tungsten Lamps" by F. E. Cady and W. E. Forsythe were treated in papers by the respective authors.

At the morning meeting of Sept. 29, G. H. Stickney presided and C. A. Atherton gave his paper on "Illuminating Engineering Factors in Electric Sign Design." It was discussed by A. H. Ford, L. Bell and A. N. Taylor. E. A. Anderson and O. F. Haas in a paper treated the subject of "Illumination and Traffic Accidents—Statistics From Thirty-two Cities." It was discussed by A. L. Dickinson, L. C. Porter, C. M. Masson, N. Macbeth, E. L. Elliott and E. A. Anderson. W. L. Goodwin gave one of his characteristic talks and E. L. Elliott, E. F. Caldwell, G. E. Doane and G. H. Stickney brought up some interesting points in the discussion.

The final session on Thursday afternoon was conducted by Gen. Harries. In the discussion of "The Lighting of Public Buildings" by A. L. Powell and E. Parker, S. G. Hibben, E. L. Elliott, C. M. Masson and E. A. Anderson spoke. Then followed a paper on "Recent Departures From the Usual Methods in Lighting Public Places and Offices" by A. D. Curtis and J. L. Stair, and the "Lighting of Clothing Factories" by A. B. Oday and R. W. Peden. The latter was discussed by E. L. Tillson and W. L. Goodwin.

Then Gen. Harries went through the formalities of inducting Dr. George S. Crampton into the office of president and the convention adjourned.

During the week the inspection trips and entertainments planned by the convention committee were all held and appreciated by those attending.

Extracts from several of the papers presented at the convention appear on another page of this issue of ELECTRICAL REVIEW.

ELECTRICAL APPLIANCES DONATED AT STATE CONVENTION.

An interesting feature of the recent convention of the Pennsylvania Electric Association, held at Bedford Springs, Pa., the principal details of which have previously appeared in ELECTRICAL REVIEW, was the president's dinner at which the drawing for the 180 prizes donated by electrical concerns took place. The prizes were the most valuable ever given at a state convention, and ranged from washing machines, dishwashers,

Illuminating Engineering Society, Rochester, N. Y., September 26-29.

stoves and platinum wrist watch to fans, lamps and other useful electrical appliances and devices. The following is a list of the chief winners, together with the prize awarded to each, and the company donating the prizes:

F. W. Shackelford, Philadelphia; "Laundryette" washer; Laundryette Manufacturing Co., Cleveland, Strond Michael Co., Pittsburgh, and J. F. Buchanan Co., Philadelphia.

S. P. Grace, New York City; electric dishwasher; Western Electric Co., Pittsburgh and Philadelphia offices.

Mrs. O. H. Cranz, West Raleigh, W. Va.; "Standard" electric stove; Standard Electric Stove Co., Toledo.

Mrs. Harris, Coatsville, Pa.; ladies' platinum wrist watch; Kuhlman Electric Co., Philadelphia.

J. F. Cole, Altoona, Pa.; Hoover suction sweeper; Hoover Suction Sweeper Co., New Berlin, O.

Mrs. William D. B. Ainey, Harrisburg, Pa.; percolator set; Rumsey Electric Co., Philadelphia.

Mrs. F. R. Cook, Pittsburgh; Tiffany traveling clock; Okonite Co., New York City.

William Brice, Jr., Bedford, Pa.; automatic electric water heater; Automatic Electric Heater Co., Warren, Pa.

W. S. McKinney, Narberth, Pa.; ozonater; Sprague Electric Co., Philadelphia.

Mrs. Henry Harris, Wilmerding, Pa.; electric "Glolog"; Strait & Richards, Newark, N. J.

ELECTRICAL APPLIANCES FEATURE NEW YORK SHOW.

Throngs Crowd 71st Regiment Armory Daily to View Electrical Exhibits, Which Included Household Appliances of Various Kinds.

The popular interest in electrical labor-saving devices and cooking appliances was again conclusively demonstrated at the 14th annual New York Electrical Show held in the 71st Regiment Armory from Sept. 28 to Oct. 8. This year's exposition was confined to one floor and the bazaar-like arrangement of the booths not only facilitated the handling of the daily capacity crowds but enabled the visitors to better observe the exhibits. Vacuum cleaners and washing machines probably received the greatest attention from the public, but the exhibits of cooking appliances, household refrigerating machines, dishwashing machines, lighting fixtures and ironers aroused more than usual interest.

The show as a whole was so successful that it is quite likely to go on the world cruise of the former American Liner *S. S. St. Louis,* which sails from New York next January and is scheduled to make stops in South America, South Africa, the Antipodes, Japan, China, India, the Mediterranean ports, England, Sweden, Germany and Norway to acquaint foreign buyers with American products.

Of particular interest to the women was the electrically operated "Whip-All" demonstrated by The Air-O-Mix Corp., 51 Beaver street, New York City, and the Serrell electric oven, which operates from an electric socket and will boil water quickly, or bake, roast, boil or broil for an average family. This latter device is a product of the Serrell Electric Appliance Corp., 25 Church street, New York City.

In the booth of the Aqua Electric Heater Co., 250 West 54th street, New York City, an installation of a kitchen sink and lavatory supplied with hot water by a model of the "Aqua Instantaneous Electric Heater," was shown. The Appliance Distributing Corp., 673 Eighth avenue, New York City, demonstrated the "Sweeper-Vac" cleaner made by the Pneuvac Co., Worcester, Mass., while the "Apex" washing and ironing machines were exhibited by the W. A. Buerkle Sales Co., 212 Livingston street, Brooklyn, N. Y.

The "Frigidaire" household refrigerating machine, which is made by the General Motors Corp., Detroit, but sold through the Delco-Light selling organization, was exhibited by the latter company, Domestic Electric Co., Inc., 43 Warren street, New York City.

A "bumping machine" designed by Thomas A. Edison in 1906 to subject storage batteries to a test of innumerable bumps, featured the exhibit of the Edison Storage Battery Co., Orange, N. J., while the Electrical Testing Laboratories, 80th street and East End avenue, New York City, showed in operation the apparatus for testing electrical appliance cords.

Among the lines of electrical cooking appliances displayed were the following: "Hotpoint," made by the Edison Electric Appliance Co., 140 Sixth avenue, New York City; "Universal," made by Landers, Frary & Clark, New Britain, Conn.; "Manning-Bowman," made by Manning-Bowman & Co., Meriden, Conn.; "Rutenber," made by the Rutenber Electric Co., 145 West 45th street, New York City, and "Western Electric," made by the Western Electric Co., 195 Broadway, New York City.

The following washing machines were demonstrated: "Eden," by the Gillespie-Eden Corp., 7 Dey street, New York City; "Thor," by The Hurley Machine Co., 147 West 42nd street, New York City, and "Western Electric," made by the Western Electric Co., 195 Broadway, New York City.

A number of vacuum cleaners were on view and among the prominent ones were: "Hoover," Hoover Suction Sweepr Co., 47 West 34th street, New York City; "Ohio-Tuec," Ohio Electric Co., Inc., 145 West 45th street, New York City; "Premier," Electric Vacuum Cleaner Co., Cleveland; "New Regina," model 22, Regina Co., 47 West 34th street, New York City; "Torrington," Torrington Co., Torrington, Conn., and the "Western Electric," Western Electric Co., 195 Broadway, New York City.

The Rawlplug Co., 461 Eighth avenue, New York City, showed examples of various applications of "Rawlplugs" in construction work, and in the booth of the Manhattan Electrical Supply Co., 17 Park place, New York City, was displayed a sectional view of the "Red Seal" battery as a representation of its formation. A complete line of electrical household appliances, including the Westinghouse automatic electric range, and electric fans composed the exhibit of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The electric lighting companies—New York Edison, United Electric Light & Power, New

York & Queens Electric Light & Power Co. and Yonkers Electric Light & Power—showed no favoritism in their displays of electrical wares and had numerous and varied interesting exhibits.

An attractive and large assortment of lighting fixtures were artistically hung in the space of the Lightolier Co., 567 Broadway, New York City. Four designs of the "Corona" lightolier, developed as the result of a demand for a unit that properly lights the table and at the same time distributes the light throughout the room, featured the exhibit.

WESTINGHOUSE TO ELECTRIFY BIG CHILEAN RAILWAY.

South American State to Expend Seven Million Dollars in United States for Modern Equipment in Conversion of Steam Road.

The Westinghouse Electric International Co., confirming the report printed on p. 524, Oct. 1 issue of ELECTRICAL REVIEW, announces that it has received final confirmation of the contract to supply the equipment to electrify the Chilean State railroad between Valparaiso and Santiago, and the Los Andes Branch. This contract, which was received from the Chilean Government through the company's Chilean agent, Errazuriz, Simpson & Co., associated with Spruile Braden of New York City, covers the most important railway electrification project undertaken since the beginning of the war, and the largest ever undertaken by an American firm outside of the United States.

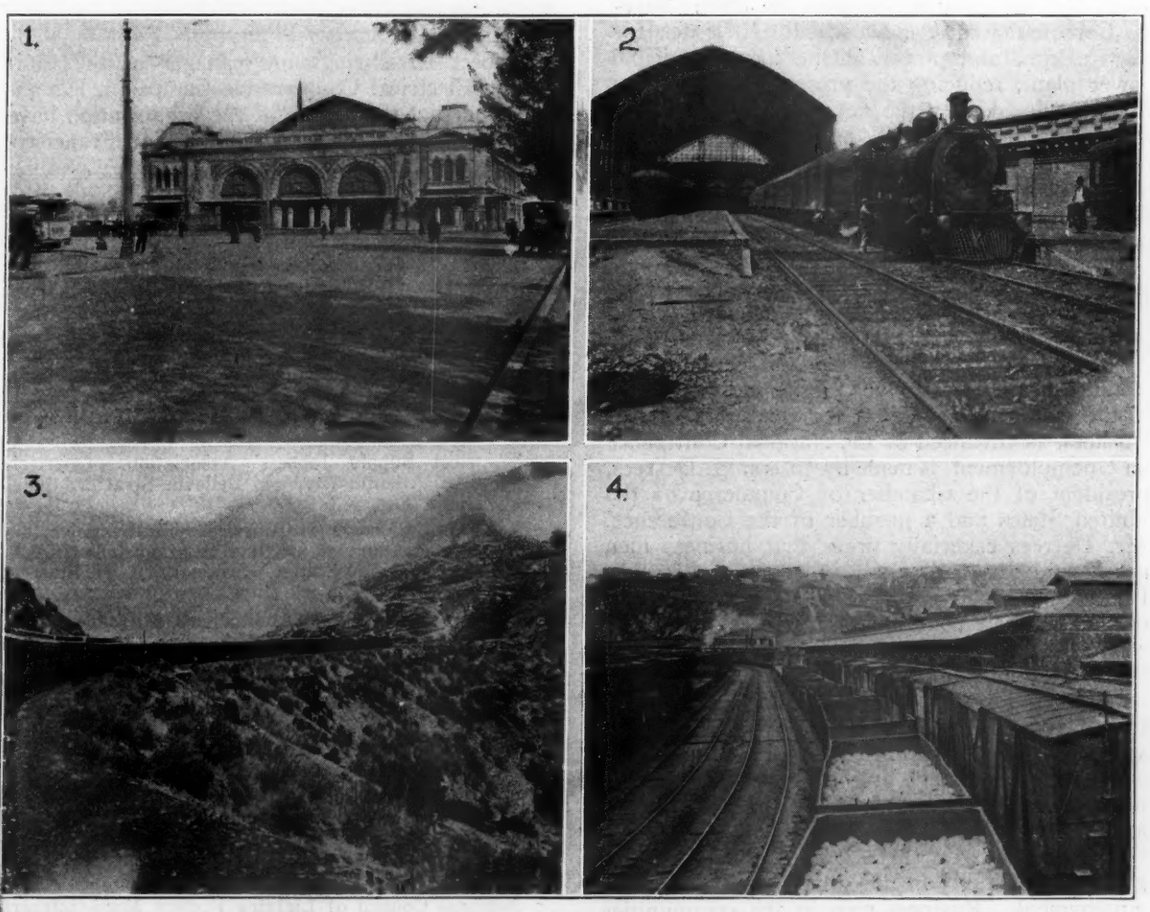
The main line, which is 118 mi. long, is now under steam operation and is the most important railway line in Chile. It connects the leading seaport (Valparaiso) with the capital (Santiago), while the line to Los Andes is 28 mi. long and forms the Chilean State railway section of the trans-continental line to Buenos Aires.

The contract, which has a total value of $7,000,000, was secured by keen competition from Germany and other European companies. The award was given to the American firm because of its more complete and correct engineering analysis of the proposition as well as its low price.

Equipment to be furnished consists of 11 local passenger locomotives, 15 road freight locomotives, six express locomotives, seven switching engines and five substations of 4000-kw. capacity each. All of these locomotives are of Baldwin-Westinghouse manufacture. The 3000-volt d-c. system which will be used will be strictly American in character.

Capacity of this equipment will be 50% greater than the railroad's present traffic demands and the plans have been so drawn that an increase of traffic capacity three times the present demands can readily be obtained. Owing to the abundance of water power in Chile, and the high price of fuel, all of the Chilean railroads will eventually be electrified and the present project is the first step in this progress.

This contract represents the third large order



Views of the Chilean State Railroad, Between Valparaiso and Santiago. No. 1—Front of One of the Passenger Terminals. No. 2—Train Shed in Rear of the Terminal. No. 3—Section of Mountain Right-of-Way. No. 4—A Terminal Freight Yard.

for electric railway supplies recently received by the Westinghouse Electric International Co. from foreign countries in the past few months, the others being obtained from France and Japan.

Other American concerns who received contracts for requirements of the Chilean railroad are the American Locomotive Co., Pressed Steel Car Co. and the Anaconda Copper Mining Co. The Errazuriz, Simpson Co. of Chile will build the overhead construction.

MUNICIPAL ELECTRICIANS ELECT OFFICERS.

At the recent annual meeting of the International Association of Municipal Electricians the following officers were elected: President, W. R. Arbuckle, superintendent of fire and police telegraph, Bayonne, N. J.; first vice-president, Charles P. Steinmetz, chief construction engineer, General Electric Co., Schenectady, N. Y.; second vice-president, J. L. Caldwell, superintendent of fire alarm, Colorado Springs, Colo.; third vice-president, D. R. Snyder, superintendent of electrical department, Augusta, Ga.; fourth vice-president, John Southwell, superintendent of fire alarm, Beaumont, Tex.; treasurer, William Crane, city electrician, Erie, Pa., and secretary, Clarence R. George, Houston, Tex.

NEW SCHEDULE OF RATES FILED.

The Board of Street Commissioners, Hagerstown, Md., has filed notice with the Public Service Commission of a new schedule of rates for electric light and power at the local municipal power plant, reducing the present charges from 15 to 20%. Under the new schedule, the first 10 kw-hrs. per mo. will be $0.07 per kw-hr.; next 30 kw-hrs., $0.05; next 200 kw-hrs., $0.04; next 260 kw-hrs., $0.03; next 3000 kw-hrs., $0.025; and all over 3500 kw-hrs. consumed in a month, $0.02.

BUSINESS AND NATIONAL CONFERENCE ON UNEMPLOYMENT.

An appeal to business men and chambers of commerce the country over to give active support to the emergency program for the relief of idle workers, as advanced by the National Conference on Unemployment, is made by Joseph H. Defrees, president of the Chamber of Commerce of the United States and a member of the Conference. Mr. Defrees especially urges that business men get behind the plan proposed by the Conference for the mayors to organize local emergency committees in their communities. He asks them to offer the mayors immediate assistance of the business organizations in order that the machinery of organization shall be speeded up on a national basis. Every town, says Mr. Defrees, has a responsibility to the nation to organize to meet this question immediately and the nation can only bring its help to bear when the cities and states are organized so as to make their help effective.

"Business," says Mr. Defrees, "has a very great responsibility in the situation. It furnishes employment. Business men in the communities should take the lead in co-operating with the mayors in creation of the emergency committees and in working out constructive community programs for relieving unemployment in their vicinities. The situation cannot be met without proper organization. It is primarily a community problem. The local business man, through his business organization and individually, should make every effort to meet the situation in his city. The existing unemployment presents a real problem which must have immediate attention."

ELECTRIC PLANTS POWER OUTPUT FOR JULY.

The production of electric power and consumption of fuel by public utility power plants in the United States for March, April, May, June and July, 1921, is covered by reports of the U. S. Geological Survey. The kilowatt-hours produced by water power for July, 1921, were 1,226,779,000. The kilowatt-hours produced by fuels for July, 1921, were 2,043,197,000. Electric power produced during July, 1921, required 2,463,640 short tons of coal; 1,029,251 barrels of fuel oil, and 1,916,781,000 cu. ft. of natural gas. The quantities in the tables issued by the Geological Survey are based on returns received from about 3200 power plants of 100-kw. capacity, or more, engaged in public service, including central stations, electric railways, and certain other plants which contribute to the public supply. The capacity of plants submitting reports of their operations is about 95% of the capacity of all plants listed. The output of plants which do not report is estimated.

Robert L. Eltringham, manager of the California Electrical Co-operative Campaign, has announced that the offices of the organization have been moved to the Rialto building, San Francisco.

COMING CONVENTIONS.

Indianapolis Industrial Exposition, Indiana State Fair Grounds, Oct. 10-15, under auspices of the Indianapolis Chamber of Commerce. Chairman, O. B. Iles, Chamber of Commerce building, Indianapolis.

Southeastern Geographic Division of the National Electric Light Association. Annual convention, Chattanooga, Tenn., Oct. 17-19. Headquarters, Signal Mountain Inn. Secretary, Charles A. Collier, Electric and Gas building, Atlanta, Ga.

Electrical Supply Jobbers' Association. Quarterly meeting of Atlantic Division, Bellevue-Stratford hotel, Philadelphia, Oct. 20.

Telephone Pioneers of America. Tenth anniversary celebration and annual meeting, St. Louis, Oct. 24-25. Headquarters, Hotel Statler. Secretary, R. H. Starrett, 195 Broadway, New York City.

Electrical Exposition, Auditorium, Milwaukee, Oct. 25-31, under auspices of the Milwaukee Chapter of the Wisconsin State Association of Electrical Contractors and Dealers, in connection with the Third Annual Food and Household Exposition, directed by the Milwaukee Journal.

American Institute of Chemical Engineers. Fourteenth annual meeting, Baltimore, Dec. 6-9. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland.

CONTRACTOR-DEALER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Goods

BETTER WAYS OF SELLING OUTLETS AND APPLIANCES.

Electrical Construction and Household Labor Saving Devices in the Home Should Be Inseparable in Ideas of Merchandising Practice.

By J. W. COLLINS,
Secretary, Electrical Contractors' Association of Chicago.

About 2 yrs. ago our contractors "caught on" with the Goodwin idea and almost overnight we had a series of neighborhood shops covering all of the prominent residence districts. Most of these were starting during the "soft" period of 1920, and they are now feeling the sharp edge of 1921 and the usual summing up that follows all "sprees." Some of our dealers take the turn as a natural occurrence, while others have come to a conclusion that the appliance business has little in common with construction.

I have tried to find a point of diversion from one to the other for the purpose, if possible, of coinciding with the two distinct views of our dealers. To date I am unable to divorce one from the other; they interlock to such an extent that an attempt to separate the two seems an impossibility.

Wiring installations are for the sole purpose of accommodating some form of appliance. Appliances can only be of service in connection with the wiring installation. In other words, "wiring is to appliance as appliance is to wiring," to use a form of equation. The product of the means is equal to the extremes. So how are we to separate the factors.

We get wiring jobs to the extent of our customers' education and possession of appliances. We, therefore, must sell the appliance idea in advance of the wiring installation. You can't sell appliances by catalogue for two reasons. You can't sell except by concentration and you can't concentrate to any degree of thoroughness unless you have sold yourself to the extent of investment. You can't sell appliances of this nature without demonstration or at least observation.

SALE OF APPLIANCES WITH INSTALLATION OF WIRING, AND VICE VERSA.

Now I want someone to show me how we are going to improve the present class of specifications to the extent of including a full quota of convenience outlets except by the conjunction of construction and appliances. There is at least one familiar appliance for every room in a home; familiar at least to the extent of its welcome as a gift if not a purchase. This being a fact, the mentioning of proper facilities for their use will undoubtedly result in facilities for their accommodation.

Talk appliances to sell wiring; that is the basis of construction's advances. You can't talk appliances as generalities; you must show your enthusiasm and faith by your own investments. That means that a home-wiring organization must sell appliances to insure installations that make their use possible and convenient.

One other adverse factor in securing the convenience outlet is the contractor's unmerciful taxation on "extras." How he soars to the sky in his prices. Extras, if he gets them, are common prey for a holdup. Extras on a job before or during construction are the cheapest outlets on the job, if the contractor figures by outlet—which most of them do.

The original plans and specifications take care of all constant costs, such as service, circuits and meters. Therefore, the addition of a few outlets is without this constant cost and therefore should be considerably cheaper. I know it to be a fact that, here in Chicago, most any contractor would quote for home wiring, using the telephone and without any reference to the existing installation, a price of about $8 for a wall outlet, commonly known as a base receptacle. What is the result? This cost adds about 50% in most cases to the cost of the appliance to be accommodated and—we don't get any closer than the telephone in getting the job.

DISADVANTAGES OF FIGURING ESTIMATES BY OUTLET METHOD SHOWN.

I contend that such outlets, above all else, should be given closer observance because, extras in old jobs establish a higher standard for new jobs. The average receptacle outlet is composed of the following—figure it out at your own cost and give the whole industry a fair deal by adding the same percentage of profit you do on competitive work:

20 ft. 0.5-in. conduit (or BX)
2 pr. locknuts and bushings (or connectors)
1 outlet box
1 receptacle and plate
1.5 hrs. time
Average overhead
Average profit

Adding these all up we find we are a long way from the $8 that is keeping us a long way from the outlets. You can't figure work by the common outlet method and produce anything but a stumbling block to the convenience outlets. Outlets are just an item of construction and should be figured independent of the balance of the installation. There is no direct ratio between the balance of the installation and the outlets and you can't arrive at any average that will work out.

There are four distinct items of home or apartment wiring and all jobs should be figured with that idea in mind:

Service—This includes cost from service outlet to service switch.

Meters—This includes cost from service through meters to cutouts.

Circuits—Includes cutouts and that portion of cutout box occupied by cutouts to first outlet on each floor. This gives one outlet free on each floor.

Outlets.—Figure them exactly what they are—loops from opening to opening.

A schedule of cost almost as simple as counting outlets can be made up that will give each job a fair consideration. Tell your customer how you figure and why he can add at least a few convenient outlets. Let them know when they are not specifying the full capacity of service, circuits and meter costs. That will beat all the general advertising and propaganda that our National organizations are using to spread the doctrine.

SIMPLE SCHEDULE OF INSTALLATION TO PROMOTE USE OF MORE APPLIANCES.

Our schedule would include the following:

Service—1-story, 1.5-story, 2-story and over, from the smallest to the largest capacity to be anticipated for each design—large apartments are like small ones except we link them together with subservices. A 12-apartment building would require one service, one subservice of full service capacity, and one subservice of one-half service capacity. Our meters and circuits and outlets would then be estimated as we would a simple 2- or 3-story building.

Meters—Their cost is in direct ratio to their number.

Circuits—There are single and double, and at times more circuits per floor, served through one meter; rarely more than three to any one point of outlet connection. We, therefore, could estimate single, double and triple circuits for 1-, 2- and 3-story buildings.

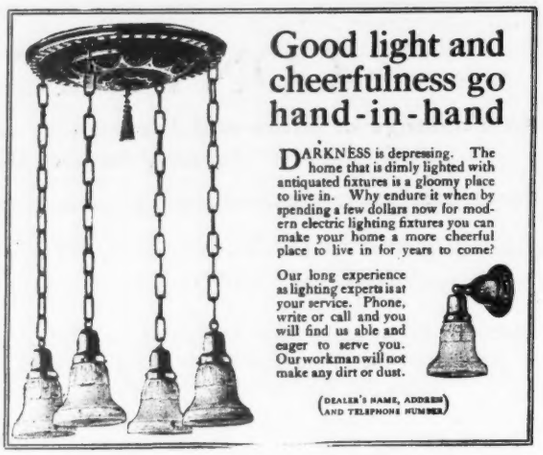
Outlets—Now that we have arrived at the outlets, estimate your ceiling, bracket, switch, receptacle and floor outlet on a fair basis, and get more of them. I know by personal contact with one construction organization that this system was the one feature that made them a controlling factor in this class of work. You can't get much closer to a proper cost by figuring by outlet than you can by weighing the plan.

Let us estimate our jobs properly and efficiently and back up the balance of the industry's efforts to establish the convenience outlet. Let us have more appliance stores in connection with our construction business to back up our wiring sales talks, for better and more complete installations to make electric helps more practical and convenient.

MANUFACTURER PROVIDES FIXTURE ADVERTISING SERVICE.

Dealers Are Furnished With Copy Layouts and Cuts, the Latter Being Billed at Cost, Subject to Cancellation When Returned.

Fixture dealers throughout the country are receiving a large folder from the Beardslee Chandelier Manufacturing Co., Chicago, which illustrates samples of advertisements for use in local newspapers. Each advertisement carries an illustration of a lighting fixture, the electrotypes of which are sent to the dealer upon request and according to selection.


Good light and cheerfulness go hand-in-hand
DARKNESS is depressing. The home that is dimly lighted with antiquated fixtures is a gloomy place to live in. Why endure it when by spending a few dollars now for modern electric lighting fixtures you can make your home a more cheerful place to live in for years to come?
Our long experience as lighting experts is at your service. Phone, write or call and you will find us able and eager to serve you. Our workman will not make any dirt or dust.
(DEALER'S NAME, ADDRESS AND TELEPHONE NUMBER)

Sample Fixture Advertisement for Local Use by Dealers.

The accompanying illustration shows one of the advertisements, at the bottom of which is a space provided for the name and business address of the dealer. Upon receipt of the folder the dealer selects the advertisements he desires to use locally. The cuts for these advertisements are then forwarded to the dealer, who has the local newspaper make up the advertisement according to the copy. The dealer is charged a nominal sum for each cut, which charge is cancelled when the dealer returns the cuts.

GOOD LETTERS THAT COLLECT FROM BAD ACCOUNTS.

Accounts That May Ultimately Be Good Are Still Bad for the Dealer if They Cramp His Credit and so Limit Business.

Book accounts, good, bad and indifferent, are a thorn in the flesh of many electrical dealers. To force collections and at the same time retain the good will of customers is a problem that is not easy to solve. A dealer in southern Illinois faced this situation and solved the problem to his own satisfaction.

Most of this dealer's business came from people who owned their homes or were in business for themselves, and, while good credit risks, they were slow in paying their bills. The dealer himself did not want to make collections, but he occasionally sent one of his clerks out to do that work. The clerk was not a collector, and about the only good he did was to personally deliver a statement to the customer, taking the money when it was offered to him, but never definitely asking that a bill be paid. This condition of affairs was unsatisfactory and finally reached its climax when the dealer was no longer able to meet his own bills.

Under these conditions it was only natural that he should complain of the fact to the salesman from whom he purchased most of his electrical goods. The salesman knew that the dealer was reliable, but that of late he had not been paying bills promptly. When the salesman handed the dealer a statement furnished him by his house he did so with an apology, saying that it

was merely a matter of form, that the credit manager did not know existing conditions, etc., etc. But the dealer realized the justice of the claim and was not offended by the salesman. Also, he knew that the salesman was afraid of offending him. Instead of asking him for the money due the salesman really as much as told him not to pay the bill until convenient. After a moment's consideration the dealer turned to the salesman-collector and said: "You are about as poor a collector as that man of mine. You are afraid to ask for the money that is rightfully yours."

Then followed the explanation. The result was that the salesman agreed to talk over the problem with other dealers and with the credit man of his house in the hope of finding some method that would enable the dealer to collect his money and at the same time retain the good will of his customers. That evening the salesman wrote a long letter to his credit manager, telling him in detail the exact conditions and asking that he find some method to help the dealer who was a good customer. It was the credit man's duty to collect money due his firm, and he had the reputation of knowing how to do it. For that reason the salesman appealed to him. The result was that the next time the salesman called on the dealer he had a definite plan to suggest. To collect the outstanding accounts from good customers he suggested that the following letter be mailed about one or two days before the clerk called to collect the account:

Dear Sir:

One of my clerks, Mr. Jones, occasionally acts as my collector. But when collections are a little poor he becomes downhearted and dejected.

He is a good man otherwise, and I like to help him along. For this reason I sometimes slip in a few easy accounts to encourage him.

Today I slipped in your statement among the others, as I know that when he calls you will accommodate him with a check for the amount of the statement.

Thanking you in advance, and awaiting your further orders, I remain

Yours very sincerely,

There is nothing in this letter to offend a customer, and at the same time it is a letter strong enough to produce results. This letter, on the electrical dealer's stationery, will produce more actual results than if letters were mailed out threatening to place the accounts in the hands of an attorney. Another letter suggested by the credit man was very effective in getting cash from outlawed accounts and professional deadbeats. In fact, it collected accounts that had previously been in the hands of an attorney without results. The second letter, while short, goes straight to the point, as can be seen from the following:

Dear Sir:

Your account, amounting to $———, has long been overdue. Unless this is paid, or definite arrangements made for future payment by (date, about 5 days), we may take action of a sort that will greatly surprise you.

Very sincerely yours,

The feature that stands out most strongly in this letter is the element of mystery. The man who gets the letter begins to think of all the things that might happen to him if he does not pay his bill—and he usually pays.

It will be noted that this letter does not make a definite threat. It simply says "we may," but it says so in such a manner that the reader infers that such action is to be taken. For the collection of old accounts—those that have long been outlawed and given up for lost—it may pay to try this letter. If there is any possible manner of getting the money such a letter should bring it. At any rate, by a trial there is nothing to lose and everything to gain.

NEW PARLAGRAPH SIGN INSTALLED IN CLEVELAND.

At the Ontario-Euclid corner of the public square in Cleveland there has just been put into operation an improved talking electric sign that is attracting much attention. The talking sign section is known as the "parlagraph," and is installed in connection with an illuminated border sign for one of the largest grocery companies of that city. On this "Parlagraph" is being run three or four different advertisements which are changed every two or three weeks. At the present time it is advertising a special brand of cigars, a brand of flour, a brand of ketchup and a salad dressing.

The capacity of the "Parlagraph" is from one to 300 words, which are seen running across the sky, flashing each word in succession. The letters appear at one side and apparently float across the face of the sign to disappear at the opposite side. Ample time is given the onlooker to read the message, and it holds the reader's attention until the entire message is transmitted. The letters are 3 ft. high and the bank of lights contain about 800 sign lamps of 10-watt size. The transcribing machine and record are said to be of an entirely new type, being greatly improved and simplified. The record is made of extremely thin sheet brass. It is enameled with insulating enamel on one side, having the enamel cleaned off from the spots which are to make contacts for the fingers as the records run over the brush block. A grand monthly total of 5,000,000,000 contacts is made in a 5-hr. daily run. This flashing mechanism is controlled by only 864 brushes.

This unique display was built and erected by the A. & W. Electric Sign Co., who plan to place a number of these signs in several large cities. The "Parlagraph" itself can be installed in large electric sign displays already in operation. It simply makes an additional attraction and gives the customer an opportunity to tell the public all about his goods. This system is called the "Travel-Light" and is supplied by the U. S. Parlagraph Co., Cleveland.

The station output of the Commonwealth Edison Co., Chicago, in 1920 was 1,883,570,000 kw-hrs.—about 1 kw-hr. for every person in the world—and 1 kw-hr. will keep 20 ordinary incandescent lamps burning for 1 hr. In a word, Chicago's electrical plant throws out the greatest light in all the world of electricity.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Application of Equipment and Methods in Practice

A Decorative Dining Room Unit in Several Styles.

Since popular taste in dining room lighting tends toward soft light for the entire room with more intense light on the table, the Lightolier Co., 569 Broadway, New York City, has developed

Bowl for "Corona Lightolier."

the "Corona Lightolier" to produce these conditions.

The unit consists of a decorative fixture available in a number of designs, a glass bowl which surrounds the 75 or 100-watt lamp used with it and a decorative silk shade inclosing the bowl and harmonizing with the fixture. The lighting bowl distributes the light and the bowl serves as a protection against the glare.

The several styles of fixtures available may be finished either in Roman gold, ivory, gold-plated or oxidized sil-

"Corona Lightolier" Fixture.

ver, while the shade colors are old rose, old gold and blue.

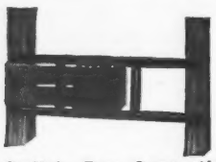
Recent Developments in X-Ray Products.

The National X-Ray Reflector Co., 235 West Jackson boulevard, Chicago, has recently developed and added some new lighting equipment to its line. The new X-Ray products are known as "Scoopettes" for show case lighting; "Indirect Lighting Art Lamp Adapter" for art lamps, and "Portable Flood Light" with color effects for automobile salesrooms.

The company has recently issued new publications as follows: Catalog No. 22, covering all X-Ray direct lighting products, including X-Ray show window lighting and fittings, show case lighting, industrial lighting and flood lighting; a booklet entitled "Perfect Lighting for the Home," which contains a description of X-Ray art lamps and indirect lighting adapters, and a booklet describing the flood lighting of the new Wrigley office building, Chicago, at night.

Combined Switch Box Support and Lath Holder.

The Kruse Electric Co., Fort Wayne, Ind., has recently placed on the market the "Kruse" switch box supporting strips and lath holders, which are thus described by the manufacturer: The strips are made of sheet metal, are U shaped, 18 ins. long, and have a bead to give



"Kruse" Switch Box Supporting Strips and Lath Holders.

them the greatest strength with least weight, indentations preventing the switch box from moving in the strip and holes are provided to receive the nails. The strips are all alike, no rights or lefts, and the same strips can be used for single or gang boxes, top or bottom. It is stated that by using the "Kruse" strip it does not take any longer to install a 6-gang box than it does a single one; also they do not prevent the plaster from clinching.

"Kruse" strips are packed 200 strips and 200 lath supports in a bundle, which weighs about 40 lbs. The lath supports are inserted into the U-shaped strip, no screws or bolts being necessary to hold them or the box. These strips can be cut with pliers. It is stated that the "Kruse" switch box supporting strips and lath holders are approved by the Underwriters' Laboratories.

Improved Line of "Red Spot" Hangers for Lighting Units.

Higher quality and greater efficiency for less money seems to be the principle on which The F. W. Wakefield Brass Co. of Vermilion, O., designed its improved line of "Red Spot" hangers for commercial lighting units. Both styles of the "Red Spot" hangers—ceiling and suspension types—are suitable for all the popular high-powered commercial lighting units including "Ace," "Phoenixlite," "Trojan" and other urn-shaped glass.

Several unique features of these hangers are thus enumerated by the manufacturer: The wireways are of sufficient size to accommodate asbestos wire of any gage necessary. The canopy is made oversize to completely cover the insulating joint and outlet box. An extra heavy brass chain with a notched ter-

Ceiling Type of "Red Spot" Hanger.

minal loop overcomes possible inequalities in the glass and insures balance to the unit when installed. Keyhole slots permit easy removal of the socket for wiring, and on the socket are two-position straps which insure correct placement of the lamp. The holder is made to fit snugly, excluding dirt and insects and minimizing the labor and cost of maintenance. The glass is secured by beveled head-holder screws which cannot loosen. The individual carton packing is insurance against damage and deterioration.

The ceiling type "Red Spot" hanger has the added feature that the holder is closed at the top, thereby conforming

"Red Spot" Suspension Unit.

with the recommendation of the National Board of Underwriters. Every detail of the "Red Spot" hangers has been designed to give the trade a hanger that combines high quality, low price, labor saving and convenience.

Features of "Amco" Auto Light Deflector.

The Art Metal Manufacturing Co., Cleveland, has recently placed on the market an auto light reflector, the main features of which are thus described by the manufacturer: "Amco" deflectors are small metal caps silverplated on the outside and aluminum finish on the inside, and so constructed that they can be snapped on the standard automobile lamp bulb. In operation these caps shut off the light on a portion of the lower half of the reflector and the aluminum surface of the inside of the cap deflects the light upwards on the upper half of the reflector from where it is projected outward and downward without glare.

The driving light of an automobile head lamp comes from the upper half of the reflector and the light that causes the glare is produced by the lower half of the reflector, so that the loss of light from the lower portion of the reflector in no way interferes with the real driving light when the "Amco" deflectors are properly installed.

New Numbers Added to Line of "Aladdin" Lamps.

In catalog No. 10 recently issued by the Aladdin Manufacturing Co., Muncie, Ind., manufacturer of "Dresalamps," "Desk-Flex" and "Tablelamps," the company lists some new numbers added to its line of "Aladdin" lamps, three of which are shown in the accompanying illustrations.

No 315 is a parchment shade lamp for

No. 315—Parchment Shade Lamp.

use on ladies' desks, in halls, boudoirs, etc. The height of the lamp is about 14 ins., shades 8 ins., and it is furnished in old ivory finish.

No. 231 is a lamp suitable for use in boudoirs, on ladies' desks, hall tables, etc. It is 14 ins. high, with 8-in. shades, and can be furnished in old ivory finish with one globe and 6 ft. of cord and plug.

No 343 is a silk shade lamp for use on ladies' desks, in halls, boudoirs, etc., and can be furnished in white and blue finish, and toque rose lined silk shade.

In addition to the lamps mentioned above the catalog illustrates and describes the company's line of "Table-

No. 231—Boudoir Lamp.

lamps," 23 ins. high, 18-in. parchment shade, and 22 ins. high, 16-in. glass shade, both having two globes and fin-

No. 343—Silk Shade Lamp.

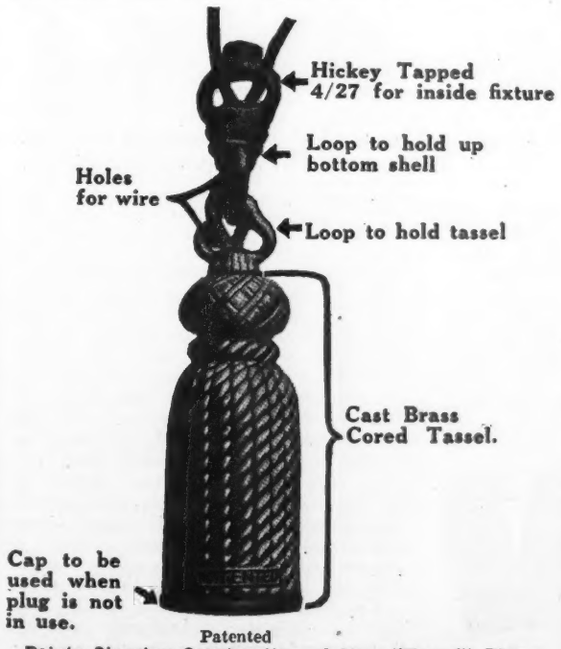
ished in Egyptian bronze, Verde green, or polychrome bronze, to suit the taste of the customer. Flexible arm lamps, adjustable lamps and other types are also shown.

Socket Outlet Designed for Easy Attachment to Fixture.

Connecting an electrical appliance to a chandelier outlet is often not only inconvenient, due to its height and the necessity of removing the glass shade or bulb, but the cord extending out of the globe is unsightly and, therefore, to eliminate these objections, Robert J. Ward & Co., 206 South 13th street, Philadelphia, has put on the market the "Tassel" plug.

This plug, which in appearance resembles the ordinary cord tassel, is made of cast brass, finished to match any type and style of fixture. The device is attached to a fixture in the following way: The bottom knob of the fixture is removed and the wires brought up from the socket in the tassel, through the hickey inside the body shell, which takes the 4/27 bottom wire, after the bottom shell has been replaced, but not tightened up, next connect wires to main fixture wires, screw the fixture together from the top and the outlet is ready for use.

When the plug is not in use, there is a cap provided to cover the socket opening in the end of the tassel and further carry out its resemblance to a cord tassel. This attachment may be applied to any room in the house and used to supply an outlet for a table lamp in the library or living room, the percolator and toaster in the dining room or the boudoir lamp on the bedroom dresser.


Hickey Tapped 4/27 for inside fixture
Loop to hold up bottom shell
Holes for wire
Loop to hold tassel
Cast Brass Cored Tassel.
Cap to be used when plug is not in use.

Patented

Points Showing Construction of New "Tassel" Plug.

Precision Instrument Known as an Inclinometer.

There has been recently placed on the market by the Young-Fischer Inclinometer Co., of Milwaukee, a new instrument known as an Inclinometer, intended to take the place of the plumb, level, or protractor in mechanical laboratories, machine shops, and in all building operations where angles are to be measured, and particularly where extreme accuracy is required.

The Young-Fischer Inclinometer is a skillfully designed tool, consisting of a carefully machined case of cast metal containing an accurately adjusted gear train driven by gravity impulse. The hand on the degree dial moves in unison with the impulse, while the hand on the minute dial is driven by the multiplying gears, causing the minute hand to make 36 revolutions while the degree dial makes one revolution. The multiplying effect of the gear train is such that the instrument gives angle readings in degrees and minutes with accuracy corresponding with that of a single dial Inclinometer having a dial approximately 10 ft. in diameter.

Aside from the greater accuracy of this instrument as compared with other devices now used for similar purposes, it is a much more handy tool, since it indicates directly, not only the vertical and horizontal, but all angles as well. For accurate inspection of angles it is also superior to the sine-bar as the dials show angles directly in the degrees and minutes, whereas with the sine-bar it is necessary to first adjust the tool and then go through a series

of calculations before the reading is obtained.

Some Features of Cutter Pulley-Socket Reflector.

An almost universal recognition that lighting fixtures must often be cleaned has multiplied the demand for a reliable cutout and lowering device by means of which cleaning and relamping may be done in absolute safety. A pulley-socket reflector, which is claimed to incorporate all these advantages, is made by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Briefly stated, the advantages of a Cutter pulley-socket reflector are: The time saved in cleaning, safety from short-circuits and accidental contact

Cutter Pulley-Socket Reflector.

with live parts, the small amount of effort necessary to thoroughly clean the fixture, and the fact that there need be no obstruction of aisles by ladders.

A pull on the rope disconnects the principal parts, and the entire fixture comes down dead. This disconnecting may be made without first switching off the circuit, for within this pulley-socket sliding contacts are provided of sufficient capacity to make and break the current of a 1000-watt lamp. The next pull resets the fixture in place. An angle reflector may be used, as it will always come back to its true position and locks into place, so that it is self-supporting.

The New "H & H" Sectional Wall Case.

In a leaflet recently issued by the Hart & Hegeman Manufacturing Co., 342 Capitol avenue, Hartford, Conn., manufacturer of switches and receptacles, "Paiste" sockets, rosettes, cutouts, attachment plugs, pipe taplets and miscellaneous wiring devices, the new "H & H" sectional wall case is described.

The manufacturer states that an entirely new principle has been used in the construction of this wall case; it is sectional, yet it has the strength and rigidity of a solid box. In gangs of any number it is as stiff as a box stamped from one piece of steel. The wall case divides in the middle, turning two screws separates the halves, then the spacers

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

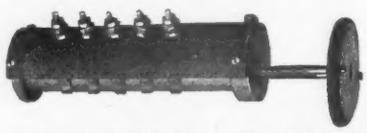
go in between—as many as may be desired.

The accompanying illustrations show the arrangement of the case. Fig. 1 depicts the way in which the single box is shipped from the factory: Fig. 2, partly open, the holding screws loosened and the box divided in the middle. The two guiding lugs in the bottom are still engaged. No side parts are thrown away with the new 'H & H," because spacers are inserted between the halves. Spacer No. 1110 is shown in Fig. 3. It is stated that the eyelet receives the holding screw on the next section or end. The screw hole just above the eyelet is spaced for all standard devices. Fig. 4 shows the single and one spacer.

The value of the "H & H" wall case lies in two points, according to the manufacturer: first, it is a "loom" box, but can be used equally well for "BX" by using the "H & H" No. 911 clamp, and second, it is satisfactory as a single box and equally satisfactory when made up into gangs.

Compact Instrument Switches for Several Circuits.

For connecting one instrument to any one of several circuits, and for making the multipoint connections required



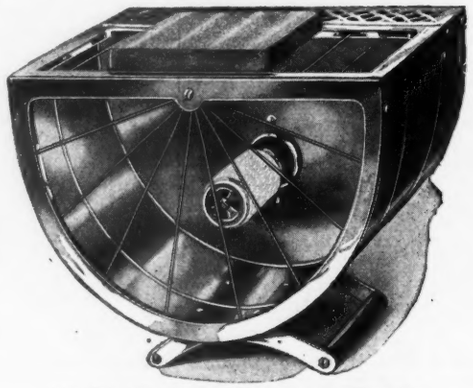
Drum-Type Switch Allows Use of One Instrument for Several Circuits.

when synchronizing generators, the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is marketing the type RS instrument switches. With the exception of the ammeter and thermocouple switches, these switches have removable keys or handles so labeled and constructed that they cannot be inserted in the wrong switches. In construction ruggedness and compactness are the salient features. Movable contact members, securely mounted on a substantial bakelite-micarta drum, engage with stamped contact fingers as the drum is rotated to the right or left. The switching element is housed in a substantial bakelite-micarta tube. A segment of the housing is easily removable for inspection and adjustment.

The types of switches in the RS line are as follows: Ammeter switch; thermocouple switch; voltmeter switch; frequency-meter switch; wattmeter switch; watt-hour meter switch; power-factor meter switch; reactive-factor meter switch; synchronizing switch for synchronizing between machines; synchronizing switch for synchronizing between machine and bus, and multi-circuit voltmeter switches.

A Combined Electric Heater and Toaster.

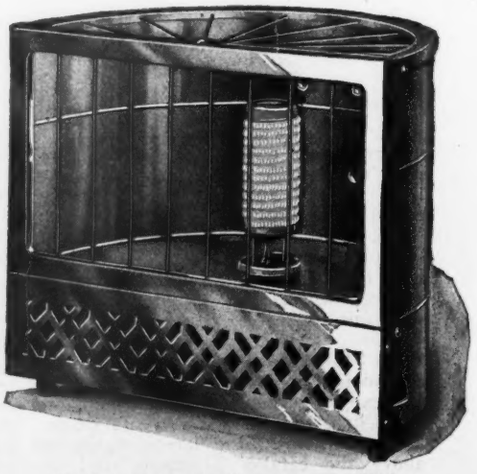
By ingenious design, the "Double-Ray" heater-toaster made by L. Plaut & Co., 432 East 23rd street, New York City, is not only an effective radiant electric heater, but the heat rays can be utilized to toast bread and thereby make the device an all-the-year-round appliance instead of being only serviceable during the winter months.



"Double Ray" Appliance as a Toaster.

The "Double-Ray" is made entirely of copper and brass and as a heater sets upright on fiber legs. In front is a removable wire guard while an elliptically curved copper reflector forms the back. The coil type heating element inside is mounted upon a porcelain spindle equipped with a lamp socket base so that it can be readily taken out. Through the design of the reflecting surface the heat rays are distributed over an angle of 100 deg.

When the "Double-Ray" is set upon the ebonized handle attached to the back of the reflector, the wire guard which was the front of the heater becomes the top and toast may be made by placing bread upon it. Thus it is always ready for either use. The device weighs less than 2.5 lbs., consumes 600 watts and is equipped with 8 ft. of flexible cord.



"Double Ray" Appliance as a Heater.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Fillmore Electric Co., Fillmore, N. Y., has filed notice of dissolution under state laws.

Eastern Electric Supply Co., 43 Market street, Portland, Me., sustained a loss of $25,000 by fire recently.

Pacific Diesel Engine Co., Oakland, Cal., builders of Diesel engines, is the new name adopted by the Skandia Pacific Oil Engine Co.

Smith & Serrell, Central avenue, Newark, N. J., has issued a bulletin descriptive of the Francke flexible coupling for use with direct-connected machines.

Star Porcelain Co., Muirhead avenue, Trenton, N. J., manufacturer of electrical porcelain products, is having plans prepared for the erection of a 1-story plant addition, 50 by 80 ft.

Welded Products Manufacturing Co., of which George F. Luehring is secretary and treasurer, 145 Clinton street, Milwaukee, is the new name adopted by the Electric Welding & Manufacturing Co.

National X-Ray Reflector Co., 235 West Jackson boulevard, Chicago, has issued catalog No. 22 covering its line of X-Ray reflectors for store window lighting, show case lighting, factory lighting and flood lighting.

Alfred Vester Sons, Inc., Providence, R. I., manufacturer of drawn and stamped brass shells and ornaments for the lighting fixture trade, has issued catalog E containing 60 pages of illustrations of its product.

Faries Manufacturing Co., Decatur, Ill., manufacturer of adjustable electric brackets, portable lamps, metal shades and fixtures, has issued a new booklet in three colors illustrating and describing its "Verdelite" line of ornamental portable electric lamps.

Luminous Unit Company Division of the St. Louis Brass Manufacturing Co., St. Louis, has issued a booklet on "Brascolite" fixtures for banks and office buildings. Sectional views are given showing the easy method of installing "Brascolites" and "Aglites" and the method of installing switches in both fixtures.

American Steel & Wire Co., 208 South LaSalle street, Chicago, has announced the appointment of E. E. Aldous as its representative in St. Paul, Minneapolis and the Duluth territory, with headquarters at St. Paul. Mr. Aldous has been connected with the company for 20 yrs. in different positions and is well posted in the various lines manufactured by it.

Gross Chandelier Co., 21st and Morgan streets, St. Louis, has issued lighting fixture catalog No. 80, illustrating and describing its line of fixtures. The catalog contains 136 pages of illustrations and descriptions of lighting fixtures for the home and business purposes. In the front part of the catalog appears a photograph of the factory and display rooms of the company. It is stated that the new "Gross fixture book goes out over the land as a message to those who would make their homes beautiful."

Kliegl Bros. — Universal Electric Stage Lighting Co.—one of the oldest and largest manufacturers of electrical stage and studio lighting apparatus, electrical and mechanical stage effects and accessories for theater and motion picture studio complete electrical

New Building of Universal Electric Stage Lighting Co.

systems in the country, celebrated its 25th business anniversary by occupying its new building at 321 West 50th street, New York City. This 4-story building is 57 by 100 ft. and has an aggregate floor space of 22,821 sq. ft. The company occupies the entire structure, having the office and stockroom on the first floor with the manufacturing departments above. Increasing volume of business compelled the addition of new machinery to the plant and prompt and efficient service is assured.

Gleason-Tiebout Glass Co., 99 Commercial street, Brooklyn, N. Y., manufacturer of lighting glassware, has issued a 64-page catalog of its cut balls, bowls, cylinders inclosing globes, lanterns and shades, while in a 3-page folder the most popular designs are illustrated. Also an attractive catalog on figured bowls, shades and inclosing globes is now being distributed.

Chas. Polacheck & Bro. Co., 217 Third street, Milwaukee, manufacturer of lighting fixtures, has issued a 127-page catalog known as the Light House Sales Book No. 30, illustrating and describing its line of lighting fixtures of all styles and for all purposes. On page 2 of the book attention is called to the high grade selection of lighting fixtures shown, including the company's new showing of the "Andalusia" and "Adornado" lines. In both of these are incorporated novel and original ideas in construction and finish, producing a harmonious and artistic effect. On pages 4 to 11 are depicted four complete selections for the home. To aid the purchaser in making a selection the company has designated the different rooms for which each fixture is suitable. The Polacheck company makes a specialty of churches, public buildings, banks and residences, and states that its designing department is equipped to make special designs for any type of lighting installations.

Cutler-Hammer Manufacturing Co., Milwaukee, has issued a 40-page catalog descriptive of its line of elevator controllers and accessories. A discussion of the types of motors best suited to elevator work is presented, as well as an outline of the usual method of selecting motors of the right horsepower and starting torque to insure satisfactory performance.

Electric Service Supplies Co., 50 Church street, New York City, manufacturer and distributor of steam and electric railway and mining equipment, has issued bulletins Nos. 180 and 182, the former illustrating and describing the Keystone turbogenerator type 532 for steam locomotive headlighting, and the latter "Golden Glow" headlights for locomotive service.

Edison Lamp Works of General Electric Co., Harrison, N. J., has recently issued a 24-page booklet on ship lighting, in which it is pointed out that the illumination demands of the modern passenger vessel are as numerous and diversified as those on land. The illustrations depict the interiors of well-lighted cabins, dining salons, smoking rooms, etc., on modern ocean-going vessels.

National Lamp Works of General Electric Co., Nela Park, Cleveland, has announced that "effective Oct. 1, there will be a general readjustment in the price of National mazda lamps. No general change is made in the price of mazda B lamps, but a general reduction in price is effective on mazda C lamps and mazda daylight lamps. The readjustment does not affect miniature lamps."

English Electric Co. of Canada, Toronto, Ont., which was recently organized, will exercise manufacturing rights of the English Electric Co., Ltd., of Great Britain, in Canada. It is stated that the company has purchased the capital stock of the Canadian Crocker-Wheeler Co., Ltd., of St. Catharines, Ont., founded in 1910, and R. A. Stinson, vice-president and general manager of the latter, will be president and general manager of the English Electric Co. of Canada.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

N. W. ELMER, formerly engineer for the Harry M. Hope Engineering Co., Boston, has established an office in Quincy, Mass., as consulting engineer in conveying and mechanical handling equipment.

W. S. HEALD, of the Duluth Edison Electric Co., Duluth, Minn., was recently appointed a member of the Federation of Architects and Engineers' Societies. He represents the Duluth Engineers' Club.

A. F. SOBEN, formerly assistant chief engineer of the American Machine & Manufacturing Co., Atlanta, Ga., has opened offices in Los Angeles as consulting engineer and designer of special and automatic machinery.

I. N. ZAVARINE, formerly metallographist of the Winchester Repeating Arms Co., New Haven, Conn., has been appointed assistant in the mechanical engineering department of the Massachusetts Institute of Technology, Boston.

A. W. ALMQUIST, for the past 21 yrs. connected with Thomas A. Edison, Inc., and affiliated industries, West Orange, N. J., in an official capacity, has resigned to accept a position as testing engineer for the Wittemann Aircraft Corp., Teterboro, Hasbrouck Heights, N. J.

PARKER M. ROBINSON has been transferred from the marine engineering department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., to the power sales department of the same company and will make his headquarters in Los Angeles as a specialist in steam power apparatus.

WALTER GRAHAM, who during the war period made investigations for the U. S. Fuel Administration and the Ordnance Department of the Army, and has also done research work for the Bureau of Standards and the Tariff Commission, is now connected with the Technical Credit Association, 2 Rector street, New York City.

R. J. WENSLEY, switchboard engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., will address the first meeting of the Pittsburgh Section of the American Institute of Electrical Engineers Oct. 11, on the subject of "Automatic Control of Motor Generator Sets for Edison Direct-Current Service." The paper will discuss the use of automatic switching equipment as applied to motor generator sets in a solution of the problem.

KENNETH A. MCINTYRE, of Toronto, Canada, has joined the staff of The Society for Electrical Development, announcement to that effect having recently been sent out by the Society. Through his close association with electrical contractors, Mr. McIntyre's services will be valuable to Society members. In the United States he will devote his time to the problems of the contractor-dealer, while in Canada he will specialize on field work among all branches of the industry. Mr. McIntyre is well known on both sides of the border as an active association worker. For over 9 yrs. he has been engaged in the electrical business in Toronto. For the past 3.5 yrs. he has been vice-president of Beattie-McIntyre, Ltd., and has specialized in the contracting end of the business. His association activities have covered a period of over 5 yrs. He was largely instrumental in organizing the Toronto Electrical Contractors' Association and was president of that organization before it expanded into the Ontario Association of Electrical Contractors and Dealers and became affiliated with the National Association of Electrical Contractors and Dealers. He still retains his chairmanship of the Ontario Association, as well as his financial interest in the firm of Beattie-McIntyre, Ltd., which company he continues to represent in association matters. For the past 3 yrs. Mr. McIntyre has been the representative from Eastern Canada on the National Executive Committee of the National Association of Electrical Contractors and Dealers, and is still a member of that committee. He is chairman of the Architects' Committee of the same association. He is also a member of the Cost Data Committee of the National Association, and through his paper at the last Buffalo convention gave electrical contractors some valuable data on installation costs. Although Mr. McIntyre's headquarters will be at the Society's offices, 522 Fifth avenue, New York City, the greater part of his time will be spent in the field.

Kenneth A. McIntyre.

WARNER S. HAYS, general secretary of the National Federation of Construction Industries, is a consulting electrical, industrial, management and industrial relations engineer of Philadelphia. Mr. Hays was born in Cleveland in 1886, and later lived in Scranton, Pa., where he obtained his grammar and high school education. He took electrical engineering at Yale Sheffield Scientific School, graduating in the class of 1907, and during his vacations worked in various positions on construction work. After 2 years in the erecting, testing, operating and engineering departments of the General Electric Co., he had 6 years as an executive on construction, management and operation of electric light and railway companies. Mr. Hays resigned to go abroad for the Vacuum Oil Company, but the war called him into service as an officer in the Construction Division of the Army, and he was placed in charge of electrical and other construction and executive work on several projects. Since his discharge he has been doing management consulting work personally, and associated with Dudley R. Kennedy in 1919, and recently with William B. Ferguson. He assisted in the survey leading to the report on the elimination of waste in the building industry, which has just been published by the Federated American Engineering Societies. He has built a reputation as an expert on all phases of sound industrial relations problems, having been retained in an advisory capacity by several firms and organizations. During his public utility experience he was active in the administration, organization and promotion of several civic and trade organizations and projects. Mr. Hays brings to the Federation an unusual combination of ability and experience which fits him admirably for the office to which he has been appointed.

A. J. CALLOWAY, who was recently appointed sales manager of the Western Electric Co. at Salt Lake City, Utah, was in the Hawthorne shops of the company for practically the entire year of 1913 and then went to San Francisco to become a buyer. He enlisted in the service at the outbreak of the war and was gone for 26 mo. A year after he came back he found himself holding down a sales specialist's berth at Salt Lake City.

ARTHUR S. BLAIR, who was recently appointed assistant superintendent of the general service department, Edison Electric Illuminating Co. of Boston, first entered the company's service in 1896 in the generating department, but resigned in 1897. He re-entered the company's employ in October, 1903, as testman in the laboratory, later becoming chief clerk and finally head of the office division, which position he occupied at the time of his transfer.

OBITUARY.

DAVID H. WILSON, Wyckoff, N. J., chief electrical engineer for the Erie Railroad Co., died recently.

SAMUEL S. VOORHEES, chemist with the Bureau of Standards, Washington, D. C., and chairman of the Corrosion Committee, American Society for Testing Materials, died recently at a hospital in Portland, Me., following an operation.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Boston, Mass.—Edison Electric Illuminating Co. reports a total connected load of 429,794 kw. for the past year, ending June 30, as compared with 417,206 kw. in the previous year, and 378,332 kw. in 1919. The company is planning to proceed with the construction of its proposed plant addition early in the coming year, to comprise extensions to the boiler and turbine departments and the installation of new turbogenerating machinery. The increase will total about 30,000 kw. Charles L. Edgar is president.

Boston, Mass.—Considerable electrical and mechanical equipment, including motors, controlling apparatus, etc., will be installed in the 4-story factory on Broadway, to be erected by the Women's Educational and Industrial Union. It is estimated to cost $100,000.

Cheshire, Conn.—Considerable electrical equipment will be installed in the industrial building to be constructed by the board of directors of the State Reformatory here, estimated to cost $30,000. Work will be commenced at once.

New Haven, Conn.—The Edward Malley Estate, 902 Chapel street, has taken bids and will soon award contract for the erection of its proposed power plant on Temple street.

New Haven, Conn.—United Illuminating Co. has filed plans for additional improvements at its plant at Grand avenue and Mill river, to cost about $20,000.

Providence, R. I.—Considerable electrical equipment will be installed in the new plant to be erected by the Williams & Anderson Co., 33 Broad street, manufacturer of emblems and metal specialties, on North Main street, estimated to cost $60,000. The building contract has been let.

Amsterdam, N. Y.—Considerable electrical equipment will be installed in the 6-story mill to be erected by the Mohawk Carpet Mills, Inc., 57 Lyons street, estimated to cost $275,000.

Jamestown, N. Y.—Considerable electrical equipment will be installed at the 1-storv plant to be erected on Blackstone avenue by the Jamestown Metal Desk Co. John A. Eckman is president.

Evergreen, L. I., N. Y.—Electric motors, controlling devices and other industrial electrical equipment will be installed in the 3-story mill to be erected at Decatur street and Cypress avenue by the Wyckoff Knitting Mills, 1842 Summerfield avenue. The new plant will cost about $125,000.

New York, N. Y.—Considerable electrical equipment, ice and refrigerating machinery will be installed at the new plant of the Inwood Consumers' Ice Mfg. Co., to be located on property at Ninth avenue and 213th street, recently acquired. The plant will be 1-story, and is estimated to cost $300,000. The company was recently organized with a capital of $200,000; R. L. Gelgardo is president. It is represented by N. F. Schmidt, 220 Broadway.

New York.—New York Edison Co., Irving place and 15th street, has received a contract from the Royal Insurance Co. for light and power service at its building at Maiden lane and William street. The insurance company will discontinue the operation of its private generating plant, and will install electrically-operated passenger elevator equipment.

New York, N. Y.—New York Steam Co., 280 Madison avenue, will commence the immediate erection of a steam-operated power house at the foot of 59th street and the East river, to cost about $400,000. Stone & Webster, Inc., 120 Broadway, has the construction contract.

Sanborn, N. Y.—Cambrie Power Co., Inc., has been granted permission by the Public Service Commission to build an electric power plant for lighting service at Cambria and Lewiston, N. Y. Construction will be commenced at once.

Silver Creek, N. Y.—Silver Creek Electric Light Co. has filed notice of increase in capital stock to $40,000, for proposed expansion.

Syracuse, N. Y.—Considerable industrial electrical equipment will be installed in the new plant of the Meldrum-Gabrielson Corp., North Franklin street, manufacturer of milling machines, etc., on West Fayette street, estimated to cost $70,000.

Syracuse, N. Y.—Electric motors, switchboard and other electrical equipment will be installed in the pottery to be constructed on Court street by the Onondaga Pottery Co., 1858 West Fayette street. Ground will be broken at once. The plant will cost about $400,000.

Waterloo, N. Y.—Waterloo Water Co. will build a new electrically-operated pumping plant on local site. L. P. Adams, Moose building, Geneva, N. Y., is architect.

Atlantic City, N. J.—Considerable electrical equipment will be installed in the local garage and service building to be erected by the Union Transfer Co., 1004 Spring Garden street, Philadelphia. C. J. Mitchell, 129 South 15th street, Philadelphia, is architect.

Camden, N. J.—If the present lighting system along the Federal street ferry is not adequate, additional lamps will be installed. Address Superintendent Mitchell.

Mount Holly, N. J.—Electrical equipment will be installed in the 2-story automobile service and repair building to be erected by W. A. Jones, Washington and King streets, estimated to cost $70,000. Folson & Stanton, 10 South 18th street, Philadelphia, are architects.

Newark, N. J.—The Public Service Railway Co., Public Service Terminal, has arranged for an issue of trust certificates to total $1,540,000, the proceeds to be used for general operations, financing, extensions and improvements.

Newark, N. J.—The Board of Freeholders, Court House, is arranging a plan of central control of the various power plants at the different county institutions, with Henry Berg, now plant superintendent at the Overbrook Hospital power house, in charge. An appropriation of $60,000 is being arranged for the construction of a new refrigerating plant at the Essex Mountain Sanatorium, Verona.

Washington, N. J.—The Washington Electric Co., has received permission from the Board of Public Utility Commissioners to increase its rate from $0.15 to $0.16 for the first 50 kwhrs. used per month by consumers.

Frankford, Del.—The town will be bonded for the purpose of installing an electric light plant. Address the mayor.

Ashland, Pa.—The Lehigh Valley Coal Co. is arranging for the installation of what is said to be the largest electrically operated pumping unit in the world at its Buck Mountain mine, near Mahanoy City. The pump will have a rated capacity of 3000 g. p. m.

Carlisle, Pa.—The Citizen's Lighting Committee, recently organized, is securing estimates of cost for the installation of a new lighting system in the business district.

Lansdale, Pa.—Philadelphia Suburban Gas & Electric Co. is planning extensions in its system to Lansdale. Application for permission has been made to the Public Service Commission. The section is being served by a municipal electric plant at the present time.

Philadelphia, Pa. — The Forrest Laundry, 1225 Columbia avenue, will commence the immediate erection of a power house and mechanical laundry at 1704-12 North Fawn street.

Philadelphia, Pa.—The Department of City Transit has taken bids for the erection of electric substations for the transit system.

Philadelphia, Pa.—The U. S. Quartermaster Department is planning the early erection of an addition to the government power house at 21st and Oregon streets.

Reading, Pa.—Consideratble electrical equipment will be installed in the 2-story hosiery mill addition, to be erected on Moss street by Frabel,

Scott & Katzmiller. Work will be commenced at once.

Williamsport, Pa. — Considerable electrical equipment will be installed in the new paper goods manufacturing plant to be erected by C. A. Reed & Co., Laurel and Willow streets, on Chestnut street, estimated to cost $100,000.

Williamstown, Pa.—Electric motors and other electrical equipment will be installed in the 2-story plant addition to be constructed by the Unrivaled Hosiery Co. J. D. Lesher heads the company.

Annapolis, Md.—The Bureau of Yards and Docks, Navy Department, has taken bids for the extension of its power house here. Work will be commenced at an early date.

Baltimore, Md.—Electrical equipment and ice-making machinery will be installed in the ice-manufacturing plant to be erected by Samuel C. Hoffberger, 503 East Monument street.

Baltimore, Md.—A 1-story power house will be erected by the Cooknut Corp., Paca and Lexington streets, in connection with the erection of its plant for the manufacture of lard substitutes, estimated to cost $85,000.

Baltimore, Md.—Considerable electrical equipment will be installed in the proposed sheet-metal manufacturing plant to be erected by Lyon, Conklin & Co., 13 Balderstone street. The works will total about 100,000 sq. ft. of manufacturing space.

Steyer, Md.—Miners' Coal Co., recently organized with a capital of $500,000, is planning the installation of electrical mining machinery, pumps, boilers and other power equipment at its properties in this district. Equipment will be provided for a daily output of about 500 tons. G. J. Lee is president, and Ira Mercer, treasurer and manager.

Washington, D. C.—The Bureau of Yards and Docks, Navy Department, has plans under way for the erection of a radio station on the Municipal Pier at Chicago. Bids will be asked under Specification 4515.

Norfolk, Va.—The Anheuser-Busch Co., St. Louis, Mo., is perfecting plans for the erection of additions to its local ice plant, to include new power and boiler equipment, and new 200-ton capacity ice-manufacturing plant, estimated to cost $250,000, with machinery. Ophuls, Hill & McCreery, Inc., 114 West 42nd street, New York City, are engineers.

Richmond, Va.—Considerable electrical equipment will be installed in the 2-story tobacco drying plant to be erected by E. K. Victor, 1800 Simms avenue. It is estimated to cost $45,000.

Bluefield, W. Va. — Appalachian Power Co. has disposed of a bond issue of $2,500,000, the proceeds to be used for general operations, extensions and improvements. C. N. Mason is vice-president.

Carthage, N. C.—Fire September 15 destroyed the power house at the plant of the Spencer Lumber Co. It will be rebuilt.

Hendersonville, N. C.—Blue Ridge Power Co. is considering plans for the installation of a local distributing system. Application for a franchise has been made.

Morgantown, N. C.—The Common Council is arranging for a bond issue of $25,000, the proceeds to be used for extensions and improvements in the municipal electric power plant and waterworks. W. J. Hallyburton is city clerk.

Pilot Mountain, N. C.—The Common Council is planning the construction of a municipal electric power plant.

Dalton, Ga.—Electrical and mechanical equipment will be installed by the Dalton Steam Laundry Co., for increased plant capacity.

Gainesville, Fla.—An ordinance has passed the City Council providing for the enlargement of the light and power plant. Address the mayor.

Key West, Fla.—Key West Electric Co. has awarded a contract to Stone & Webster, Milk street, Boston, for the erection of its proposed addition to the local generating plant. The extension will be 30 by 66 ft., and the installation will provide for an increase of about 800 hp. The work is estimated to cost $150,000.

Leesburg, Fla.—Considerable electrical equipment will be installed at the new local pulp manufacturing plant of the Grass Fibre Pulp & Paper Corp. The initial capacity will be about 40 tons. W. F. Stovall is president. The company is capitalized at $1,000,000.

Tampa, Fla.—Electrically operated hoisting and conveying machinery, haulage equipment, etc., will be installed in the municipal waterfront terminals to be constructed by the city. A bond issue of $1,000,000 is being arranged for the work. A. W. D. Hall is city manager.

NORTH CENTRAL STATES.

Bridgman, Mich.—Officials of the Benton Harbor-St. Joseph Railway & Light Co. are considering a proposition to extend a power line south from the city.

Denver, Ind. — Denver Electric Light & Power Co. has been incorporated with a capital of $10,000 by Alonzo C. Cunningham, Lee S. Long and Elvin R. Long.

Evansville, Ind. — The merchants on Main street, from Water and Eighth streets, have voted to improve the street lighting for their blocks. Address the mayor.

Bloomington, Ill.—The city will erect a power line from the city pumping station to the west side water plant. Clerk H. J. Wilson is bidding for estimates for copper wire and fittings, the estimated cost to be $2200.

Burlington, Ill.—Burlington Electric Co. of Kane county, has been incorporated to construct and operate an electric transmission line from Hampshire to Burlington to furnish light, heat and power. The capital stock is $3000, and the incorporators are Fred Pfingsten, H. A. Hattendorf and L. F. Kinef.

Canton, Ill.—Canton Gas & Electric Co. has made preparations to construct an electric transmission line from Dunferline to East Liverpool.

Chicago, Ill. — William G. Keith, commissioner of gas and electricity, room 614, City Hall, received bids Oct. 4 for the furnishing of 300 cast-iron street-lighting fixtures.

Chicago, Ill.—Bids were received Oct. 6 for underground conduit construction by the Sanitary District of Chicago. Address James H. Lawler, room 700, 910 South Michigan avenue, Chicago.

Clinton, Ill.—It is reported that the Dewitt county supervisors are in the market for an electric light plant to be installed at the county farm.

Herrin, Ill.—Money is being raised for the extension of the interurban line from Murphysboro and Carbondale to Herrin. Address Dr. Frank L. Davies, Herrin.

Eagle River, Wis.—A loan of $18,000 will be asked by the village board for the purpose of a water main extension, street work and the installation of a new generator for water power. Address the mayor.

St. Paul, Minn.—Northern States Power Co. has filed application for a patent covering a power project which contemplates utilizing the power on the Mississippi river between St. Paul and St. Cloud. Address E. E. Staff, 71 West Fourth street, St. Paul.

Kansas City, Mo.—Kansas City Light & Power Co. has acquired property at Glasgow, near Armstrong, Mo., and is reported to be arranging to use the site for the erection of its proposed electric generating plant, estimated to cost $1,000,000.

Kansas City, Mo.—Considerable electrical equipment will be installed in the proposed flour mill to be erected by the Kelly Mill Co., Rochester and Park streets, estimated to cost $500,000, including machinery.

Memphis, Mo.—The Common Council is planning for the installation of a new electric unit in the municipal power plant.

Rosedale, Mo.—Bids were received Sept. 30 for the installation of a street-lighting system. Address H. H. Adkins, mayor.

Sedalia, Mo.—Considerable electrical equipment will be installed by Swift & Co., in its new 2-story packing plant to be located on a local site, estimated to cost $175,000.

Springfield, Mo.—Bell Telephone Co. plans to spend several thousands of dollars in making extensions to its lines. Address R. G. Porter, district manager.

Kansas City, Kan.—The City Engineering Department has completed plans for the construction of a power plant at the Quindaro pumping station for the waterworks system, estimated to cost $25,000. Rose & Peterson, Barker building, are architects. Howard Payne is city clerk.

McCracken, Kan.—Light and water improvement bonds to the amount of $35,000 have been voted. Address the mayor.

Wichita, Kan.—Kansas City Gas & Electric Co. contemplates increasing its present power capacity to 40,000 kw., which is thought to be the limit

of the present water facilities. Address L. C. Ripley, vice-president.

SOUTH CENTRAL STATES.

Bowling Green, Ky.—Considerable electrical machinery will be installed in the local oil refinery to be erected by E. J. Riggs and associates, estimated to cost $50,000.

Cornishville, Ky. — Cornishville Lighting Co. has been incorporated with a capital of $3000 by S. T. Roberts, E. B. Moore, H. Gardner and others.

Lexington, Ky.—Lexington Utilities Co., Limestone street and London avenue, will commence the immediate erection of an addition to its power plant, estimated to cost $100,000. A number of contracts for the work have been awarded. J. P. Pope is general manager.

Louisville, Ky. — Antler Electric Co. has been organized to operate a local electric system. The company is headed by William F. A. Thomas and R. L. Ogden.

Louisville, Ky.—Contemplated additions and improvements to the telephone system of the Louisville Home Telephone Co. include two new exchange buildings, installation of additional switchboards and the laying of miles of cable, according to recent announcement by President P. S. Pogue.

Holt, Miss.—Charles Conner will erect a feed mill and in conjunction with the grinding business will develop electricity for commercial use.

New Orleans, La.—A 25-year franchise has been granted to Harry K. Johnson, 1003 Hibernia building, for the construction of an electric light and power plant in New Orleans.

Gravette, Ark.—H. D. Jenkins, Harrison, Ark., and associates are planning the establishment of a new power plant at Gravette for local light and power service.

Russellville, Ark.—The Common Council has perfected plans for the installation of a new street-lighting system in the business district.

Stuttgart, Ark.—The City Council is considering preliminary plans for the installation of a municipal electric power plant.

Lahoma, Okla. — The Common Council is planning the installation of a new light and power system.

Clarksville, Tenn.—Clarksville Ice & Coal Co. is planning the rebuilding of its ice-manufacturing plant, recently destroyed by fire with loss of about $50,000. Considerable electrical equipment will be installed.

Jellico, Tenn. — Electrical equipment, including motors, etc., will be installed by the Jellico Fire Brick Co., in connection with extensions to its plant for increased production. The company was recently organized with a capital of $100,000. Frank L. Smith is secretary and treasurer.

Tracy City, Tenn.—Staub Coal Co. is planning the installation of electrical machinery and other mining equipment at its properties at Daisy, Tenn. It is planned to develop a daily output of 500 tons. E. M. Jones, Chattanooga, Tenn., is consulting engineer for the work. C. E. Wisner is president.

Waco, Tex.—Considerable electrical machinery and equipment will be installed in the cement manufacturing plant to be constructed here by the Southwestern Portland Cement Co., El Paso, Tex., estimated to cost $1,000,000. Carl Leonardt is president.

WESTERN STATES.

Everett, Wash.—Puget Sound International Railway & Power Co., 860 Stuart building, Seattle, is now making a survey in connection with a project to furnish light and power service to the country districts adjacent to Everett.

Portland, Ore.—Construction of a 75,000-hp. hydroelectric plant on the Clackamas river is the principal objective of the Portland Railway, Light & Power Co.'s decision to sell $10,000,000 of 7% prior preferred stock.

Tillamook, Ore.—Application has been made by J. H. Rosenberg for a permit to appropriate water from a nearby stream to operate a light and power plant.

Los Angeles, Cal.—The City Club, Broadway and Eighth streets, is interested in the construction of a dam at Boulder canyon as a part of the flood control and water conservation plans for the Colorado river district.

Red Bluff, Cal.—Pacific Gas & Electric Co. plans to spend $24,000 on improvements to its system in this city. Address H. B. Heryford, manager.

CANADA.

Dresden, Ont.—The Board of Supervisors, Camden Township, has plans under way for the construction of a hydroelectric transmission system for local power and light service. E. R. Fowler, 190 University avenue, Toronto, is engineer.

Kingston, Ont.—The Board of Directors, Kingston General Hospital, will build a power plant for service at the institution and at the Queen's University, estimated to cost $75,000.

St. Catherines, Ont.—The Public Utilities Commission has approved a minimum rate of $0.50 a mo. for domestic lighting service.

Windsor, Ont.—Considerable electrical equipment will be installed in the cold storage plant to be erected by the Essex Provision Co., 1120 McDougal street, estimated to cost $600,000.

PROPOSALS.

Washington, D. C.—Sealed proposals will be opened Oct. 20 in the Treasury Department, supervising architect's office, for the installation complete of a fire-alarm system in the U. S. Public Health Service Hospital, Fort Logan H. Roots, North Little Rock, Ark., in accordance with the drawings and specification, copies of which may be had at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

Charleroi, Pa.—Bids will be received Nov. 1 by the Chamber of Commerce for a "white way" lighting system. The estimated cost of the project is $18,000. Address J. S. Heffner.

Washington, D. C.—Sealed proposals will be opened Oct. 19 in the Treasury Department, supervising architect's office, for an ice-making refrigerating plant in the kitchen and mess building at the U. S. Public Health Service Hospital No. 27, Alexandria, La., in accordance with specification and drawings, copies of which may be had at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

INCORPORATIONS.

West Palm Beach, Fla.—Palm Beach-Everglades Telephone Co. Capital $10,000. Incorporators: W. D. DaCamara and others.

Hartford, Conn.—Presto Electric Devices Co., Phoenix National Bank building, has been organized to manufacture electrical specialties. E. F. Kaiser is president and treasurer; and T. H. Grace, vice-president.

Bristol, Conn.—Excellight Co.. Capital, $25,000. To manufacture electric lamps and other electrical equipment. Incorporators: F. N. Manross, Rudolph Stern, Forestville, Conn.

Brooklyn, N. Y.—Parkway Electric Co. Capital, $5000. To manufacture electrical equipment. Incorporators: B. E. Simmons, L. M. Wilk and D. Moran. The company is represented by Eisenberg & Eisenberg, 1475 Broadway, New York City.

New York, N. Y.—Tri-Electric Co. Capital, $10,000. To manufacture electrical specialties. Incorporators: W. A. Doyen, W. A. Klein and E. S. Klausner, 80 Delancey street.

New York, N. Y.—International Spectacle Corp. Capital, $50,000. To manufacture electrical devices and equipment for theatrical purposes. Incorprators: L. McCormick, D. Hines and C. M. Rubanks, 50 Pine street.

New York, N. Y.—Sunlight Arc Co. Incorporated in Delaware with capital of $22,000,000. To manufacture electric arc lamps and kindred products. Incorporators: J. Austin Hermer, Herman F. Harris and W. E. Haskin. The company is represented by the Capital Trust Co., Dover, Del.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Marine Pumps (79)—A commercial agent in England desires to secure an agency on commission for the sale of marine pumps and accessories.

Engines and Pumps (84)—A commercial man from India who is in the United States has formed a partnership with an American business man and desires to secure the representation of manufacturers of machine tools, boilers, pumps, small engines, etc.

Electrical Appliances (92)—An importing company in India desires to secure an agency and purchase electrical appliances, lamps and tools. Quotations should be given c. i. f. Cochin, Alieppey, or Tuticorin. References.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Toledo Edison Prior Preferred Stock Offered to Public.

The National City Co. of Chicago and New York City is offering a new issue of $2,500,000 Toledo Edison Co. prior preferred stock, 8% cumulative, series "A." The company does the entire electric light and power business in Toledo, O., and certain suburbs, serving directly a population in excess of 260,000, and, in addition, furnishing electric power at wholesale to companies supplying other neighboring communities, the total population thus served directly and indirectly being estimated to exceed 310,000. The company also distributes artificial gas and does a hot water heating business in Toledo.

It is stated that the Toledo Railways & Light Co. having sold all of its railway properties, has instituted proceedings to change its name to the Toledo Edison Co. and to acquire the property of the Acme Power Co.

Baltimore Utility's Gold Bond Issue Sold.

The entire issue of $9,000,000 Consolidated Gas, Electric Light & Power Co. of Baltimore 7% sinking fund gold bonds, series "C," convertible, dated Oct. 1, 1921, and due Oct. 1, 1931, offered last week at 97.5 and accrued interest, yielding about 7.35%, by a syndicate composed of Alex. Brown & Sons, Brown Brothers & Co., Lee, Higginson & Co., Jackson & Curties and Spencer, Trask & Co., Chicago, has been sold.

Bond Offering of Aluminum Company of America.

The Aluminum Company of America has sold $18,000,000 12-yr. 7% debenture bonds to the Union Trust Co. of Pittsburgh and a group, including the Guaranty Trust Co. of New York, the Bankers' Trust Co. of New York, Lee, Higginson & Co. and the Mellon National Bank of Pittsburgh. The bonds were offered publicly last week at 99.5 to yield 7.08%. The proceeds from the sale of the bonds will be used to retire bank loans and provide additional working capital for the corporation.

North American Light & Power Co.

	1921.	1920.
12 mo. gross	$3,362,147	$2,434,042
Net after taxes	859,631	673,955
Surplus after charges	321,846	118,096
Balance after preferred dividends	235,910	65,515

Columbia Gas & Electric Co.

For 12 mo. ended August, 1921—

		Increase.
Gross earnings	$14,829,895	$912,497
Oper. expenses, taxes	7,697,203	657,784
Net operating earnings	7,132,691	254,712
Other income	2,685,417	127,571
Total net	9,818,108	382,283
Fixed charges	699,150	1,583
Surplus	4,553,421	139,863

Detroit Edison Co.

	1921.	1920.
August, gross revenue	$ 1,732,532	$ 1,689,829
Net income	379,697	150,015
Surplus after deductions	86,967	*68,956
For 8 mo. ending August 31—		
Gross revenue	15,028,094	13,672,949
Net income	3,794,486	2,461,693
Surplus after deductions	1,569,598	956,558

*Deficit.

Philadelphia Co. and Subsidiaries.

	1921.	1920.
July gross	$ 446,725	$ 907,013
Net loss after taxes	80,174	*222,079
7 mo. gross	6,618,809	9,141,739
Net after taxes	2,023,267	3,582,282

*Surplus.

Offering of Lexington Utilities Co. Gold Bonds.

A new issue of $560,000 Lexington Utilities Co. first lien and refunding 6% gold bonds, series "B," dated April 1, 1921, and due April 1, 1936, is being offered at a price to yield over 8% by Chandler & Co., Inc., New York City. The proceeds of these bonds will be used to acquire underlying bonds, for extension and improvements to the property and for other corporate purposes.

The Lexington Utilities Co. does the entire electric light and power business in Lexington, Ky., supplies power to urban and interurban railways, and under wholesale contracts furnishes all power used by other public utility companies, with one exception, operating in central Kentucky. It manufactures and distributes the entire ice requirements of the city of Lexington and wholesales in the adjoining territory.

Pacific Power & Light Co.

	1921.	1920.
July gross	$ 246,084	$ 214,682
Net after taxes	106,316	90,518
Total income	110,296	91,227
Surplus after charges	54,280	46,523
12 mo. gross	2,890,097	2,427,252
Net after taxes	1,298,327	1,111,286
Total income	1,370,277	1,120,100
Surplus after charges	719,511	590,856
Balance after preferred dividends	497,261	399,562

Pacific Gas & Electric Co.

	1921.	1920.
August gross	$3,091,751	$3,213,593
Net after taxes	1,117,617	982,522
Surplus after charges	418,015	325,596
8 mo. gross	25,046,278	22,465,802
Net after taxes	9,048,087	7,553,740
Surplus after charges	3,301,128	2,535,124
Balance after preferred dividends	1,869,025	1,333,300

Duquesne Light Co. and Subsidiaries.

	1921.	1920.
August gross	$1,209,993	$1,125,915
Net after taxes	377,746	217,638
8 mo. gross	10,749,628	9,534,863
Net after taxes	3,710,917	2,820,633

Winnipeg Electric Railway Co. to Call Stockholders' Meeting.

The Winnipeg (Man.) Electric Railway Co. has called a special meeting of stockholders for Oct. 10 to consider the advisability of the company guaranteeing principal and interest of a $7,500,000 issue of Manitoba Power Co., Ltd., 7% bonds due 1941, and also of making a power contract known as the Great Falls on the Winnipeg river, near its present hydroelectric plant. First installment will be about 60,000 hp. with an ultimate capacity of 168,000 hp.

Fort Worth Power & Light Co.

	1921.	1920.
July gross	$ 207,607	$ 242,370
Net after taxes	101,560	73,769
Total income	101,932	74,966
Surplus after charges	84,947	58,460
12 mo. gross	2,865,860	1,940,478
Net after taxes	1,116,546	936,186
Total income	1,120,718	945,348
Surplus after charges	921,117	775,132
Balance after preferred dividends	817,447	679,036

Utah Securities Corp. Subsidiaries.

	1921.	1920.
August gross	$ 688,642	$ 695,212
Net earnings	311,969	321,009
12 mo. gross	8,766,982	8,077,363
Net earnings	4,147,122	3,862,076

Dividends.

	Term.	Rate.	Payable.
Allis-Chalmers, com.	Q	$1.00	Nov. 15
Allis-Chalmers, pfd.	Q	$1.75	Oct. 15
Cent. Ill. P. S., pfd.	Q	1.5%	Oct. 15
Hurley Mach., pfd.	Q	1.75%	Oct. 1
Hurley Mach., com.	Q	$0.50	Oct. 6
Ill. Nor. Util., pfd.	Q	1.5%	Nov. 1
Middle West Util., pfd.	SA	$1.50	Nov. 15
Mount. States Pr., pfd.	Q	1.5%	Oct. 30
Nor. States Pr., pfd.	Q	1.75%	Oct. 20
P. S. Co. of N. Ill., com.	Q	1.75%	Nov. 1
P. S. Co. of N. Ill., pfd.	Q	1.5%	Nov. 1
Philadelphia Co., com.	Q	$0.75	Oct. 31
Philadelphia Co., pfd.	SA	$1.50	Nov. 1
Wash. Water Pr.	Q	$1.75	Oct. 16
West. St. G. & El., pfd.	Q	1.75%	Oct. 15
Western Pr. Corp., pfd.	Q	1.5%	Oct. 15

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Sept. 26.	Bid Oct. 3.
Public Utilities—			
Adirondack Electric Power of Glenns Falls, common	6	9½	11
Adirondack Electric Power of Glenns Falls, preferred	6	69½	72
American Gas & Electric of New York, common	..	101½	101
American Gas & Electric of New York, preferred	6	38	38½
American Light & Traction of New York, common	..	91	89½
American Light & Traction of New York, preferred	6	79	79
American Power & Light of New York, common	4	56	57
American Power & Light of New York, preferred	6	66	66
American Public Utilities of Grand Rapids, common	..	12	9
American Public Utilities of Grand Rapids, preferred	..	17	17
American Telephone & Telegraph of New York	9	107	108½
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	8	11
American Water Works & Elec. of New York, 1st preferred	..	46	51
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	30	37
Cities Service of New York, common	+extra	117	122
Cities Service of New York, preferred	6	43½	46
Commonwealth Edison of Chicago	8	108½	109
Comm. Power, Railway & Light of Jackson, common	..	8	8
Comm. Power, Railway & Light of Jackson, preferred	6	26½	25
Federal Light & Traction of New York, common	..	7	8
Federal Light & Traction of New York, preferred	..	43	53
Northern States Power of Chicago, common	..	44	44
Northern States Power of Chicago, preferred	ex.div.7	80	79
Pacific Gas & Electric of San Francisco, common	..	56	57½
Public Service of Northern Illinois, Chicago, common	7	79	79
Public Service of Northern Illinois, Chicago, preferred	6	79	80
Standard Gas & Electric of Chicago, common	..	7½	7¾
Standard Gas & Electric of Chicago, preferred	8	33	33¼
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	3½	4½
Western Power of San Francisco, common	..	26	26
Western Union Telegraph of New York	..	82½	83
Industrials—			
General Electric of Schenectady	8	124½	125½
Westinghouse Electric & Mfg. of Pittsburgh, common	7	45¼	46